Precision SHOOTING

Dealing exclusively with extreme rifle accuracy

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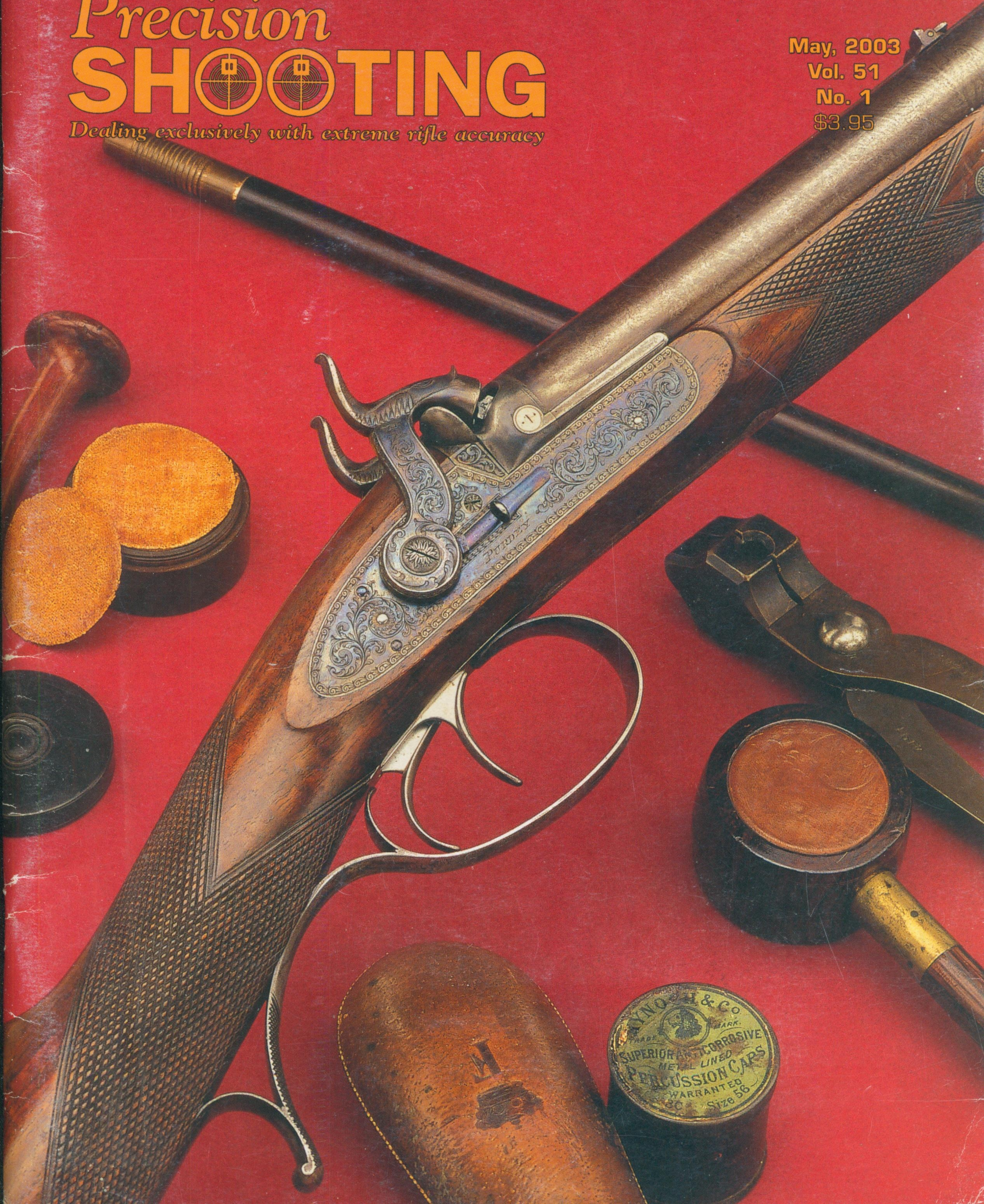
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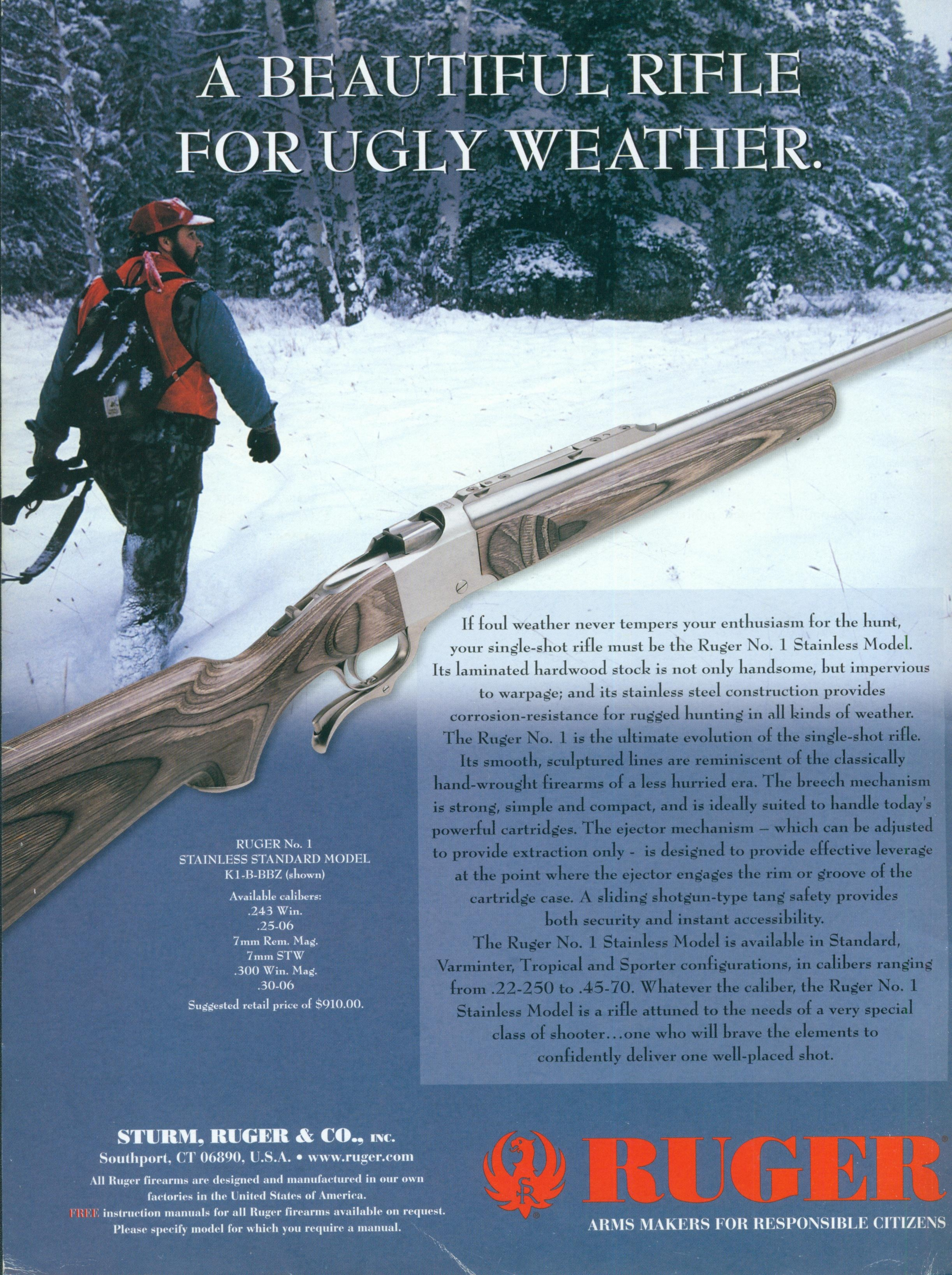

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EDITORIAL

According to lore, there was a critical moment near the beginning of the first Gulf War in which the first President Bush realized some of the darker implications of the conflict he was about to enter. He was not paralyzed, but it gave him pause.

And Margaret Thatcher told him: "This is no time to go wobbly, George."

Journal Inquirer (Manchester, CT)
April 1, 2003 Editorial

Nobody ever said it would be easy... Every now and then we have to sort of spell out a bit of history for *Precision Shooting* magazine, if for no better reason than the fact that there are some folks out there with a pretty murky idea about our business plan generally.

Precision Shooting initiated publication in 1956, with the intention of providing coverage for the sport of benchrest shooting. Gradually, over a period of time, other competitive shooting disciplines began to appear in the pages of **PS**, with highpower and smallbore being the most prominent. In 1970 the (largely) northeastern benchrest shooters split off from the NBRSA and formed the IBS organization. The IBS stayed with *Precision Shooting* as their official publication, and the NBRSA elected to go elsewhere. By the early 1990s the magazine had become pretty much IBS benchrest only, and it became obvious to the **PS** Board that we have too small a potential readership here; we're going to have to either expand our scope of coverage, or go out of business.

As it exists today, *Precision Shooting* has probably about 15% of its readership in the benchrest community, another 15% in the highpower or smallbore community, and the majority 70% of the readership are not competitive shooters, but rather are individuals with a great interest in rifle accuracy matters.

If there are a dozen articles in an average issue of **PS**, then it falls to the Editor to have a balanced issue to the extent that is possible or practicable in any given month. For instance, if benchrest enthusiasts make up 15% of the readership then it simply is not logical to have 50% of the articles be benchrest coverage. And ditto for highpower/smallbore. An ideal distribution of content would be something along the line of five articles going to competitive shooting matters, and seven going to non-competitive rifle accuracy matters.

Alas, it is not always within our power to have an "ideal distribution of content". There are times when we are up to our ears here with good input on "this" and virtually nothing at all on "that". A disproportionate content issue can be depended on to draw "incoming", but as we have explained a few times over the years...we can't print what we don't receive.

All competitive shooting coverage is kept in *Precision Shooting*; there is no competitive shooting coverage in *The Accurate Rifle*. Probably 75-80% of the content at **TAR** is again rifle accuracy-related, with 20-25% being given over to big game hunting (primarily Africa) or handguns.

Berger Bullets recent developments... All the assets of both Berger Bullets and J-4 Jackets were recently acquired by the Sheeks family, who are also the owners of CARAN Precision Engineering and Manufacturing Corp., a leader in precision manufacturing technology. Recent press releases have emphasized the continued involvement of both Walt Berger (as Technical Advisor) and Eunice Berger (responsibility for sales and marketing duties). CARAN is reported as having extensive metal forming expertise, which will be a plus to the staff which is made up of most of the original staff responsible for Berger Bullets. See their ad in this issue for more detailed contact information.

Cold Welding Can Ruin Your Day was the title of an article that Randolph Constantine authored for our readership back in the January, 1995 issue of **PS**, dealing with certain problems emanating from the bullet and interior case neck bonding. As a result, when inquiries come in here on this topic they get bounced off to Randolph...which is a good example of what could happen to a writer whom the Editor feels is "my resident expert" in just about any field, ranging from canning to quilting. A copy of a recent letter from Randolph to a gentleman with problems in this area was kind of interesting, and I thought I might steal a bit of verbiage for you, gentle reader...

"There are three possible things going on with your ammo: cold-welding, corrosion bonding, and other bonding. I'll discuss each of them.

1) COLD WELDING. This is a little known phenomenon that occurs when two pieces of metal are placed into contact with one another *under pressure* for a relatively long period of time at normal temperatures. What happens is that over time, molecules from each piece of steel actually diffuse into the other, creating a bond. While this can happen with iron and steels, it happens much faster with metals such as copper and zinc, the two major components of both cartridge cases and bullet jackets. I wrote my article on this topic because I experienced a bad problem with erratic and increased pressures in some 308 Win. ammo that I had loaded in 1988 and did not get to shoot until late 1993. I pulled the bullets from this ammo a little at a time over the next year, but did not pull all of it apart until sometime in late 1994. The bond got progressively stronger the longer I waited.

"The time required for cold-welding to

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Editorial

Continued from page 3

become a problem in ammunition depends on several things: cold welding proceeds faster between clean surfaces. The loads I had trouble with had been loaded in cases that had been tumbled until they shone and the bullets were new Sierra 168's that were not moly-coated because I did not start moly-coating until 1995. Brass that has an oxide coating in the neck, either from annealing or from just normal light tarnish seems not to cold-weld to bullets, at least not with the speed that polished brass does. Likewise, tarnish on the bullets might also prevent the problem.

"Cold-welding proceeds faster at higher temperatures, certainly not a problem with your ammo that got submerged; but temperatures are definitely higher in Texas in the summer than they are here in Colorado. Higher pressure between the two pieces will also increase the speed of cold-welding, but I doubt that any handloader can get neck tension very much than any other handloader because brass has a fairly low elastic limit.

"2) CORROSION. This is what I think is probably the major cause of your problems. Your idea on "galvanic soldering" is probably right on the money. Cartridge brass is usually 70% copper and 30% zinc; bullet jacket material is usually 90% to 95% copper and 5% to 10% zinc. In the presence of water, some zinc might migrate from the case neck to the bullet jacket, creating a bond, just as zinc migrates to cover scratches on galvanized steel. Also, corrosion is usually the worst at a triple-point junction between metal, a liquid and air, which may explain why some of your cases failed at the base of the neck.

"We can expect that rounds submerged for several days would have some water get down into the case between the bullet and the case neck. If the rounds had been loaded for a fairly long time (maybe ten years or more) and subjected to high temperatures such as a Texas summer, it is likely that the powder may have begun to deteriorate. The presence of a significant amount of moisture may interact with the nitrogen compounds in the powder to produce nitrous and nitric acids, which also would not be good for the brass since the acid would react more quickly with the zinc than with the copper. My guess is that the neck breaking off and going down the barrel with the bullet was caused by triple point corrosion, possibly made worse by the presence of acids formed by the oxidation of some nitrogen compounds from the powder.

"3) OTHER BONDING. You mentioned a problem with World War I 30-06 ammo but did not describe it in your letter. Was it really World War I and not World War II? Not that it matters much. Military 30-06 ammo had the bullets sealed into the neck with an asphaltum compound. Obviously this "tar" would sort of glue the bullets into the neck. Over the years the solvents and plasticizers in the tar would evaporate and change the strength of the bond. As the tar dried out, the bond would get stronger. The Army rifle teams took measures to break this bond just before using such ammo if it was more than about five years old. If you have old military ammo in which the tar had dried out and it got submerged, it is likely that the tar would have cracks in it large enough that some water would be able to get down past the bullet into the powder to cause the corrosion problems described above.

Randolph Constantine"

Oops...

In the "About The Cover" blurb for the April issue of **PS** the cover photographer made something of a statement to the effect that the scope on the handsome cover rifle was of unknown make. Had we quit while we were ahead, and allowed that sentence to stand-as-written, hindsight shows we would have been much better off. But no, the (censored) Editor had to open his big fat mouth and invite input from the readership...which he *knows*, from past experience, is essentially sticking out his chin and inviting Mike Tyson to try his left hook. (By way of

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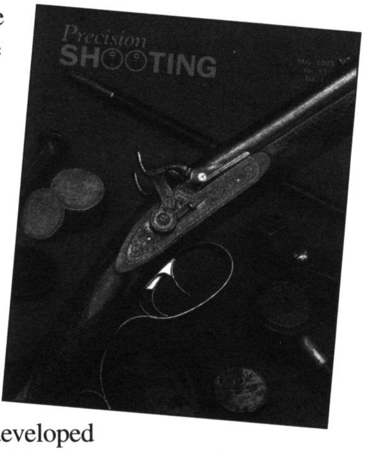
ABOUT THE COVER



Built in 1847 for Britain's Lord Foley, the featured and mahogany cased Purdey double rifle is shown here with only a few of its accompanying and serial numbered accoutrements, accessories, gizmos, and gadgets. A note penned in Purdey's own hand and found in one of the casing's many lidded compartments, describes the function of and procedure for employing an included device—a rarely encountered implement used to facilitate the loosening of bore-lodged bullets.

From a time when James Purdey was all but consumed by the many ponderables surrounding rifle accuracy, No. 4197 was designed to shoot an experimentally configured 16-bore projectile developed by the firm's namesake himself. Of course, the matching numbered mold casts just such a bullet. According to the maker's records, a pair of 16-gauge shot barrels was subsequently added in July of 1849, though the current whereabouts of the tube set is unknown, and there are no accommodations for same in No. 4197's originally configured and trade labeled case.

With its 29-inch barrels, superbly grained thinshell stock, and original ramrod in place, this elegant caplock from one of the world's most recognized and esteemed makers tips the scales at an even eight pounds. No. 4197's sights consist of a blade front complemented by a standing 100 yard and 150 yard folding leaf at the rear. Trimmings include sling mounts, steel butt plate, and exquisitely engraved patch box.

The rifle's bores, lock works, and exterior finishes remain virtually as they were when leaving 314 1/2 Oxford Street, London, England, now over a century and a half ago. Lewis Drake and Associates of Murray, Kentucky, generously provided this lovely Purdey for photography.

Bill Headrick

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Editorial

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weak explanation, the photo came in here in slide format and the Editor promptly passed it along to Kim in our office for her handling of The Monthly Fight With The Printer over the cover layout. Thus neither the photographer nor the Editor had anything to intently study when the words "scope maker unknown" were penned.)

A mere two days after the April issue was mailed the firestorm began; shortly thereafter a sandstorm in the Iraqi desert began to have a lot of appeal as a place to hide out in.

Our first caller was columnist Bob Greenleaf, who is a mere 25-30 miles north of our office. Thus the short distance involved was sufficiently inconsequential for Robert to offer to drive here and loan me his eyeglasses, which kind offer I elected to decline. A mere ten minutes later the fellow who handles our shipping and receiving, in Whitehall, NY…John Hollister, to be exact, called. John is a bit further away, perhaps a four hour drive, but he did offer to ship posthaste a large bunch of carrots, which he was sure would do a lot for the Editor's eyesight. Another kind offer that I declined; the only creatures that really like carrots have short tails and hop around delivering Easter baskets.

Okay, let's get this over with. The photo clearly shows the name "Stith" thereon, and anyone with half a brain knows that "BC" after the Stith name likely means "Bear Cub", a popular line of scopes that were marketed nationally by the Stith firm, and made for them by Kollmorgan Optical Company, once of Brooklyn, NY and later of Northampton MA. After a 1950-1956 period of making the scopes for Stith, the Kollmorgan company elected to market the Bear Cub line under their own name. Kollmorgan, in turn, was bought out by Redfield in 1959.

Our sincere thanks to the 14 thousand callers on this, and also to the dozens of you who shipped old eyeglasses and cases of carrot juice to our office.

Editor

A cat that has been burned on
a hot stove
Won't get on another one,
But he won't get on a cold
one either.

Source unknown

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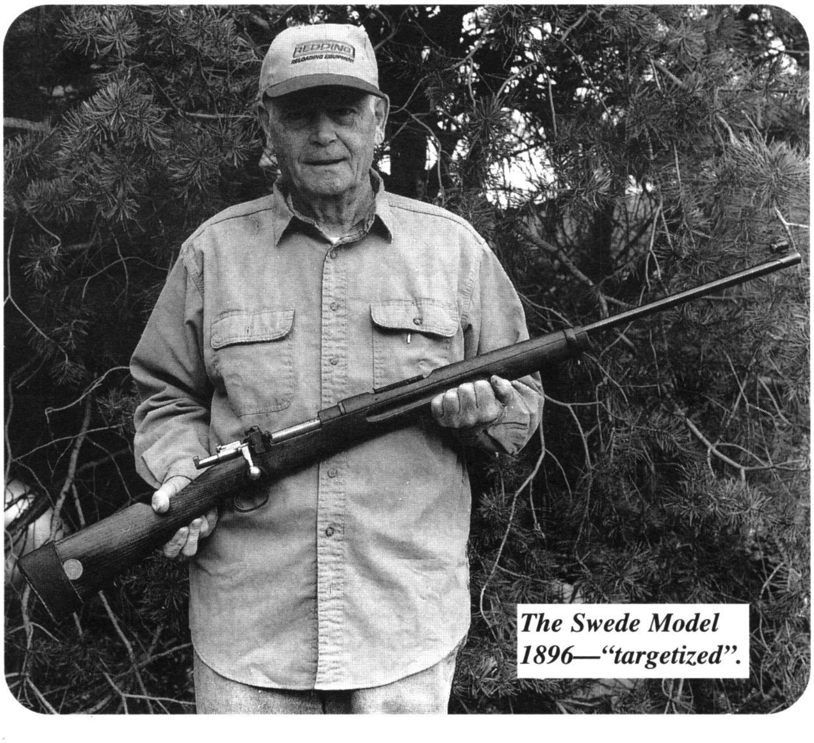
SWEDISH MODEL 1896 MAUSER to TARGET RIFLE

BY FRED BARKER

Sweden's military Mauser Models of 1894 and 1896 rifles and their 6.5X55mm cartridge have earned a world-wide reputation for accuracy in the last 100 years. The 6.5X55 cartridge, first used in the cavalry carbine of 1894, initially carried a round-nose bullet of 156 grains, until 1941 when a pointed boat-tail bullet of 139 grains was adopted. The infantry rifle, Model of 1896, bearing a 29.1-inch-long, carefully bored and rifled barrel, not only was used by the Swedish army but also by tens of thousands of civilians in casual and formal competition and for hunting the local moose and other game. Factory-reloaded ammunition was turned out by the millions of rounds for these shooters. Nils Kvale, employee of the Norma ammunition company, shooter and writer of the 1950's and 1960's, stated that the M1896 rifles and the carefully loaded 6.5X55 ammunition regularly gave 10-shot minute-of-angle groups in machine rest shooting. Many competitors altered their rifles for match shooting by adding aperture sights. Steve Kehaya and Joe Poyer's detailed book on all aspects of these rifles, *The Swedish Mauser Rifles* (1999, North Cape Pub., 714-832-3621), describes how the Carl Gustav factory converted M1896 actions to the CG63 and CG80 target rifles with new barrels, stocks, triggers and aperture sights. This book gives piece-by-piece descriptions of the many variations of the Model 1894 and 1896 rifles.

Several years ago, when Pete Forras and I concluded a trading session involving a nicely sporterized Model 1898 Krag rifle, a buffalo robe, various powders and primers, etc., I owned a well-preserved Model 1896 Mauser manufactured in 1919. Pete had looked through some 50 of these rifles in a Seattle warehouse and picked out the best three. Bust what does one do with an M1896 Swede rifle? Their $200 or so price (see ads in *Shotgun News*) doesn't warrant keeping one in its original condition, so I decided to convert mine to an informal target rifle, especially for offhand practice where its long, slow firing pin fall would necessitate careful follow-through.



The Swede Model 1896—"targetized".

The origin of the Swedish carbine and rifle and their cartridge was summarized by Nils Kvale in the June 1959 issue of *The American Rifleman*. In 1867 Sweden's army had adopted the Remington Rolling Block rifle and a 12.17mm rimfire cartridge. Starting in 1889 some of these rifles were converted to the 8mm Danish cartridge, but a repeating arm clearly was needed. In 1892 and 1893, after many other European nations had adopted bolt-action rifles and various 6.5, 7 or 8mm-caliber ammunition, the Swedish Army tested Mannlicher, Mauser (pre-sumably the model of 1893 just adopted by Spain) and Norwegian Krag rifles. The Mauser was chosen. The Norwegians, who had been loosely dominated by Sweden since the union of 1815 and wished for complete independence, were not happy with this choice. Let me now quote Kvale (himself of Norsk origin) from that same article:

"The 2 countries had not been able to get together on the army rifle. Norway wanted to adopt the Krag-Jorgensen, and one reason may have been financial since the Mauser rifle could not be had without a royalty payment. Neither could the Krag, but the money would remain in the country, and furthermore there might have been a political reason for adopting a rifle of Norwegian design differing from that of Sweden. Another point worth mentioning is the inventor of the Krag rifle, Ole Harman Johannes Krag, was superintendent of the only Government arsenal in Norway, and probably did not have much against seeing his own design in production. Time would prove that the Swedes drew the longer straw in adopting the Mauser. Although they had to pay a 5% royalty to Mauser, the gun was sufficiently superior to the Krag that the expenditure must have paid off."

Paul Mauser, in cooperation with the Swedish army officers, made several changes in the Spanish Mauser action of 1893 to first give the Swedish Model 1894 cavalry carbine and then the Model 1896 infantry rifle. These included: (1) deepening the thumb cut in the left receiver wall and compensating for the loss in guidance of the left bolt lug past this cut by putting a guide rib on the bolt body that ran in a groove in the lower side of the bridge; (2) putting a vertically projecting stud, with knurled upper surface, on the rear of the cocking piece (the function of this stud still is a matter for speculation); (3) cutting a shallow notch in the firing pin that engages the safety when the action is closed and that pulls the tip of the firing pin out of contact with the primer of a round in the chamber (so the rifle is safe with a round in the chamber); (4) drilling two small (about 2.5mm in diameter) gas escape holes in the bolt forward and rearward of the extractor collar; (5) and bending the bolt handle of the carbine (for horse carry) but not that of the infantry rifle. The cock-on-closing feature of the Spanish Mauser was retained.

These Swedish Mausers do not have quite *all* the distinctive features of Paul

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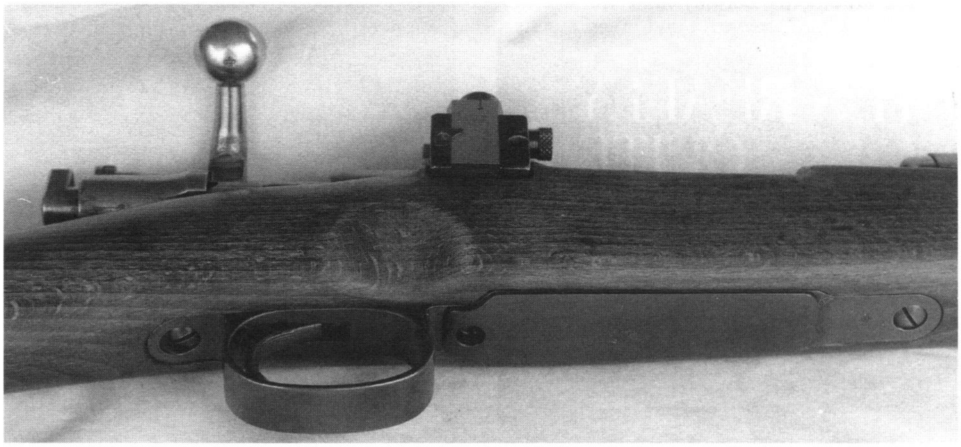

Lower metal is like that of 1898 Mauser.

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Long out of print, these novels have become impossible to locate. Arrowmaker, *reprinted in 2000 was the first;* The Black Rifle, *originally published in 1977, is the second to be reprinted. Note the extremely small press run...1000 copies only.*

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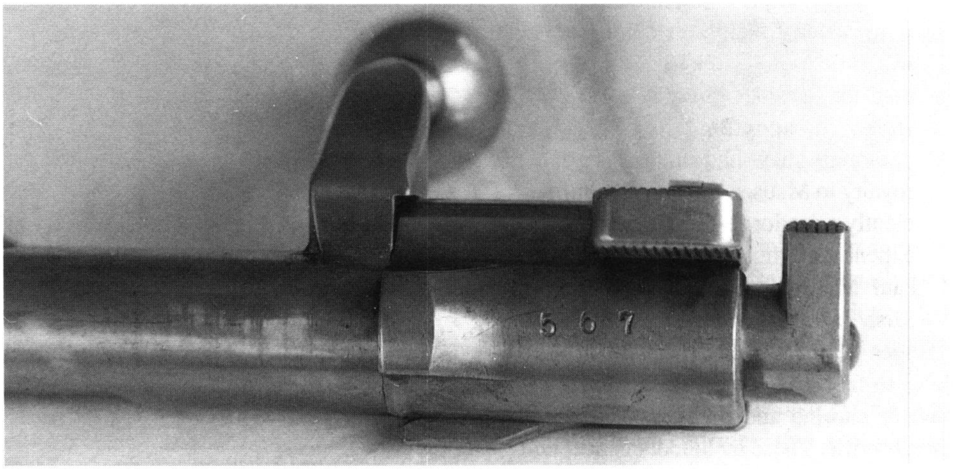
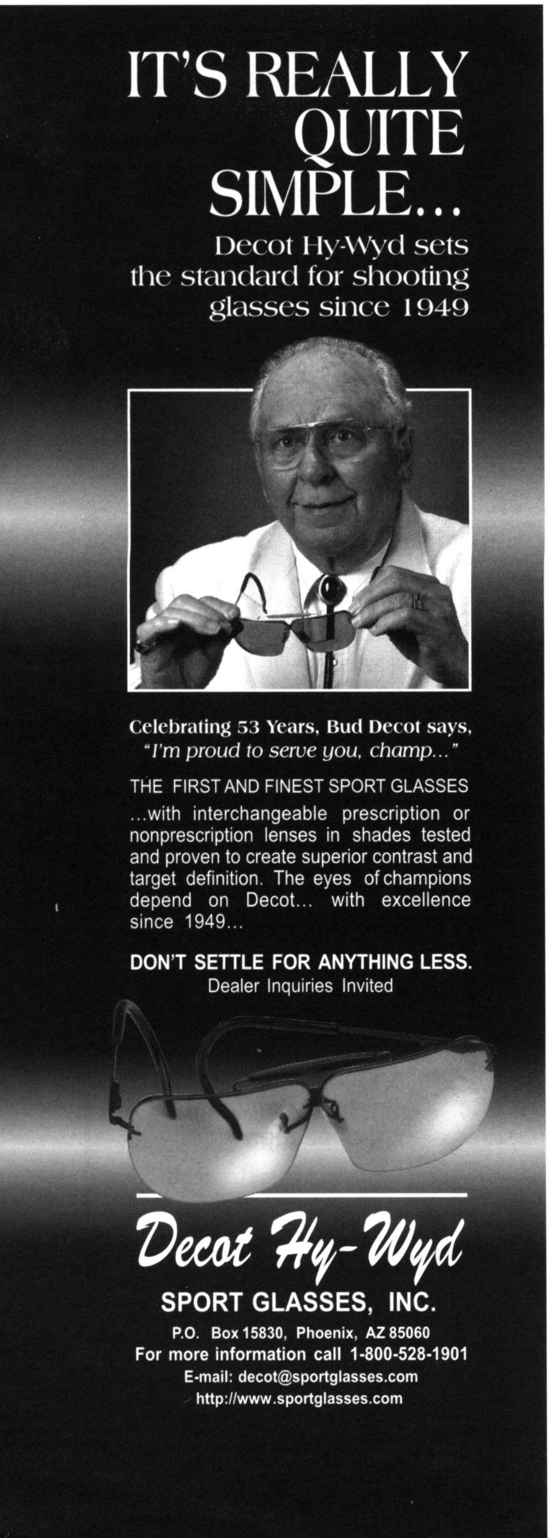
Swedish Model 1896 Mauser To Target Rifle

Continued

Mauser's final design of 1898: in particular, the gas-deflecting flange at the front of the bolt sleeve or the bolt-sleeve lock that positively prevents rotation of the sleeve when the bolt is rearward; the inner collar of the receiver ring; the safety lug on the bolt body; the interlock at the front end of the firing pin (which is not needed, anyway, on a cock-on-closing action); and some other minor features, Engineer Stuart Otteson gives a detailed account with patent information of Mauser's progression in design features from the Belgian rifle in 1889 (the first successful model using a smokeless powder cartridge) to the classic of 1898. His book, *The Bolt Action Rifle* (Winchester Press, 1976), easily is the best reference on many early military and civilian bolt actions. Famous Mauser design items of the 1898 type that are found in the Swedish rifles include: twin front locking lugs; long, external, non-rotating extractor; one-piece firing pin with lugs mating it to the hole in the cocking piece; one-piece, milled trigger guard-magazine unit with detachable floorplate; and three-position wing safety on top of the bolt sleeve. The receiver ring of the Model 1894-1896 Mausers is 1.3 inches in diameter and its wall thickness at the extractor cut is about 0.100 inches, so this action does not have the strength of the 1.4-inch-diameter of the Model 1898 design.



Bolt sleeve, unique head of cocking piece (before bluing).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Early production of Swedish Mausers was at the German Oberndorf factory, but by 1898 all were made at the Carl Gustav factory in Eskilstuna and, starting in 1941, at the Husqvarna plant. The steel used in the rifles manufactured at Eskilstuna and Husqvarna, of course, is Swedish. Sweden has two major deposits of iron ore: that at Bergslagen is relatively low in phosphorus and other impurities; the other, at Kiruna—though enormous (several billion tons)—is of average quality. The high-quality Bergslagen ore has been used domestically and gives Swedish steel its excellent reputation; the ore from Kiruna mostly is exported. Thus the steel used in most of these rifles is first-rate (that used in the Oberndorf manufacture apparently is good, but quality data is lacking).

In their book Kehaya and Poyer state that these actions were heat treated to give case hardening 0.020 inches thick. But there apparently were variations in their heat treating. Larry Racine, expert gunsmith, tool and die maker and Palma shooter of New Hampshire, (phone 603-357-0055), has worked on and shot many Model 1896 rifles. He agrees with Nils Kvale that many with their original barrels—including one of his carrying a Unertl target scope—shoot well under a minute-of-angle. However, Larry has found that some of these receivers are soft—by prolonged shooting, drilling and tapping holes for sight bases, and with his hardness tester. He notes that some receivers, in shooting many hundreds of rounds with near-maximum charges, have developed set-back in their receiver-ring bolt-lug seats. The area immediately under each bolt lug is deformed slightly and pounded rearward; and the remaining non-bearing surface is not. So Larry can feel the bolt lugs of such a receiver settle into place just as the bolt goes into its firing position. He also feels a stiffness in extracting fired rounds, as the bolt lugs are rotated out of the depressed areas and have to ride over the adjacent, undeformed parts of the lug seats. This condition also has been reported for some pre-1920 Mauser M1898's, old M1903 Springfields that were annealed soft, and some other bolt-action rifles. Larry also checked the hardness of an Eskilstuna rifle made in 1899, getting readings of 16-17 Rockwell C on the flat to the rear of the locking lug. This old receiver collapsed when tightly clamped in an action wrench during removal of the barrel. Larry also has found hard bridges and soft receivers in other Swede actions. Such soft receivers are not immediately dangerous, but must be shot extensively with full loads to deform the lug seats and give excess headspace. Proof firing of newly made rifles in the Swedish factories of two rounds at about 62,000psi in a soft receiver usually was not sufficient to give a noticeable change in headspace, so they were passed for service. The usual cautuions about shooting older rifles apply here: (1) shoot sub-max loads only (see below); (2) always watch how the bolt locks into position and then extracts a fired round, as Larry did; and (3) check for excess headspace in a fired round—a slightly extruded primer or even a partial head separation. Any shooter who would like to reload the excellent 6.5X55 case to its full potential (i.e., at 50,000-55,000psi) is well advised to use a rifle with a strong, modern action.

My Model 1896 rifle, whose receiver ring is stamped with the date 1919 under the Carl Gustav factory marks, has most of its parts stamped with the last three digits of the serial number, which is something a prospective buyer of one of these rifles should consider. I poked a Hawkeye bore scope into its barrel and saw a near-new surface with a finish about like that in a Krieger cut-rifled barrel. Larry Racine says that most or all of the Swede barrels appear to have been hand lapped. So this rifle was an obvious candidate for "targetizing" (as per the words "accurizing" and "sporterized" already in our jargon). Here's the list of what I, with Larry Racine's help, did to

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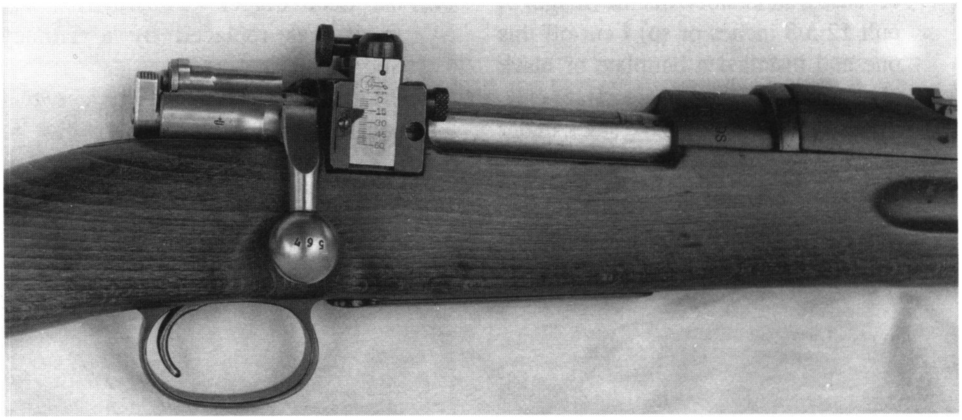

Lyman 48 receiver sight, Timney Sportsman trigger.

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Swedish Model 1896 Mauser To Target Rifle

Continued

"old 1919" or "567" as I call it:

(1) Larry drilled & tapped the receiver for a Lyman 48 sight.

(2) the barrel was hacksawed just to the rear of the issue front sight, squared, polished and recrowned.

(3) an old front-sight ramp having a standard 3/8-inch dovetail was installed.

(4) a Lyman #17 aperture front sight was set in the ramp.

(5) the stock forward of the rear band was cut off (as with most Swedish target conversions).

(6) Larry bent the bolt handle (I simply do not like horizontal ones).

(7) because a short stock fits me (length of pull 12 5/8 inches or so) I cut off this one and installed a buttplate of black phenolic resin.

(8) a depression was cut in the stock under the bolt knob.

(9) the stock was glass-bedded behind the recoil lug.

(10) the stock—of beech wood—was sanded with 150, 320 and 400-grit paper, lightly dyed with brown, alcohol-base leather dye, and finished with six coats of tung-oil-plus-turpentine (with rubbing by 0000 steel wool between coats).

(11) a leather boot was put on the butt.

(12) a Norwegian 5-kroner coin, bearing the strong profile of King Olav V, was glued into the depression in the buttstock to replace the original missing disc. (My only Swedish coins, one-kroner pieces, were too small. Olav V, to date, has not complained about being placed on a Mauser, rather than on a Krag, rifle.)

(13) the issue trigger had a heavy pull, so it was replaced by a Timney Sportsman.

(14) the bolt handle, bolt sleeve, safety and cocking piece were blued (which to my eye much improves the appearance of the rifle).

Notes: Garry (817-346-9633—see his ad in the **PS** *Trading Post*) can supply many types of target sights. Another option for a rear sight is to install a Redfield base and Olympic or International sight. Designing an override-type trigger for a cock-on-opening action such as this, whose cocking piece over-rides the sear, is a challenge: if a replacement trigger is installed, make certain that it has sufficient overlap of the sear and trigger surfaces. If in doubt have it checked by a gunsmith.

A general guideline for reloading the 6.5X55 cartridge for a Swedish Mauser was given by Norma's Nils Kvale in *The American Rifleman* of January 1961: all loads should operate at less than 50,000psi (and at that time were so loaded by Swedish ammunition companies). His article gave a popular load of 43.0 grains of IMR4350

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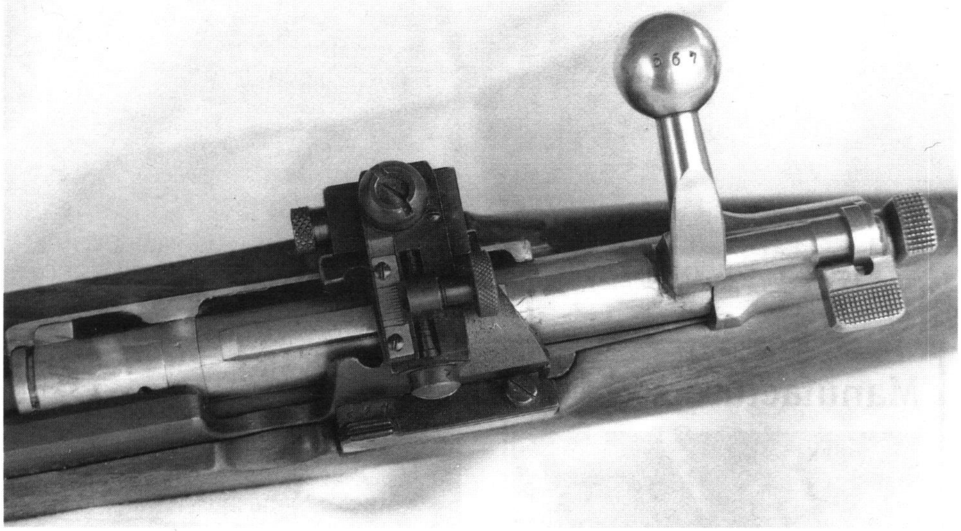
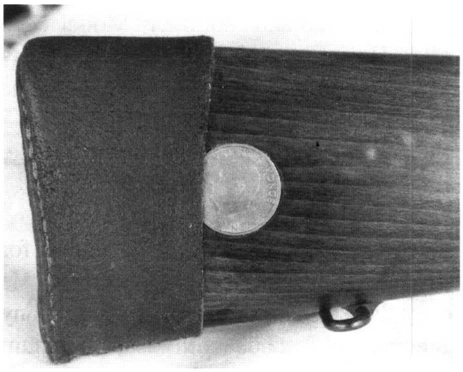
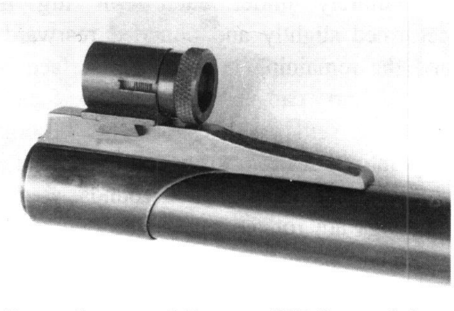


Note long extractor, deep thumb cut, guide rib on bolt, bent bolt handle.



King Olav V, leather boot.



Ramp base and Lyman #17 front sight.

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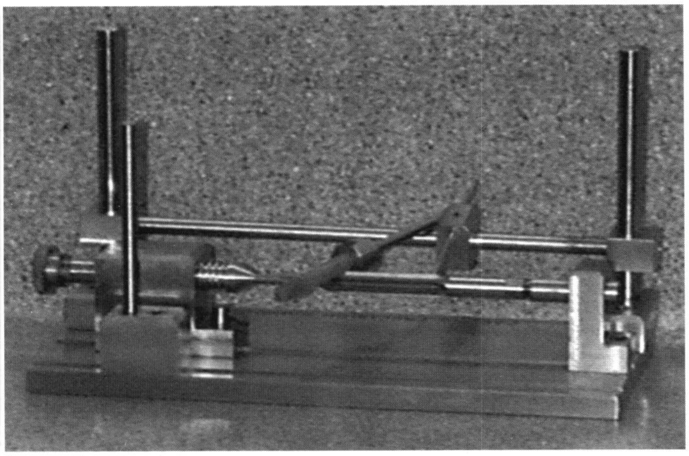

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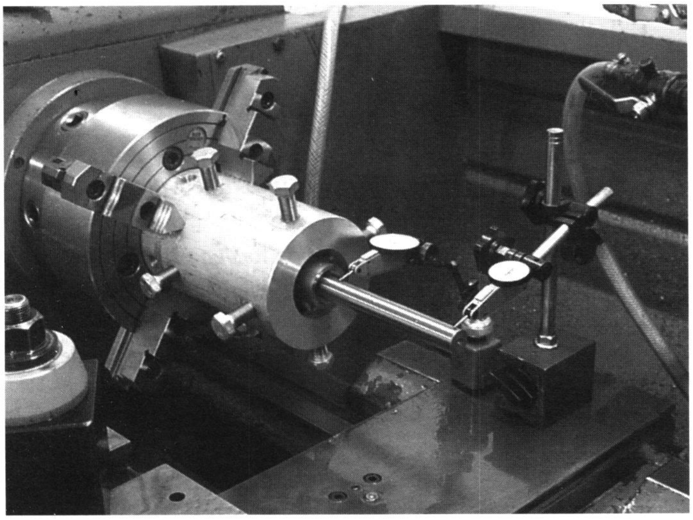

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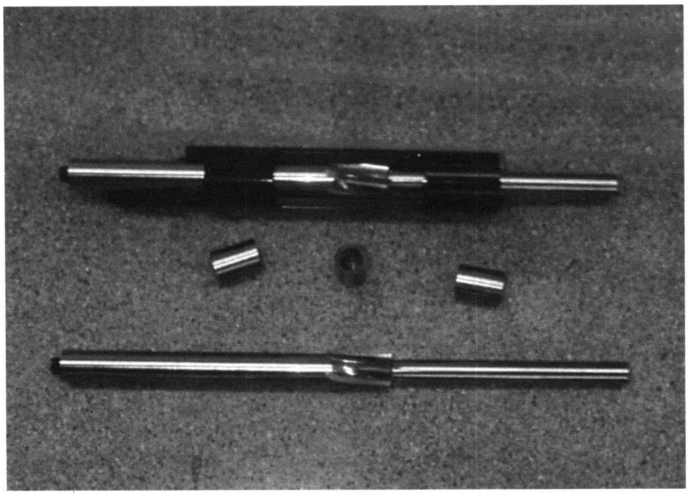

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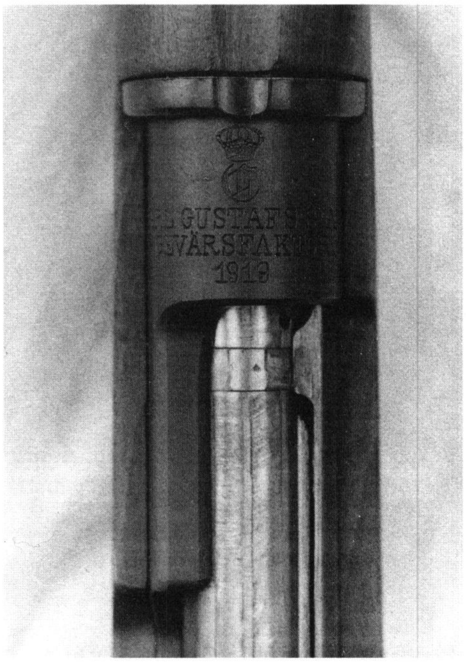
Swedish Model 1896 Mauser To Target Rifle

Continued from page 12

with 139-140-grain bullets, at 43,820psi (in a Norma pressure barrel) and 2,600-2,650 ft/sec in 29-inch barrels. In looking through much of our plentiful loading data on the 6.5X55 cartridge I see some loads that probably exceed Kvale's maximum pressure and others that are safe. Several of the manuals give pressure data, others do not. Hornady's manual and Sierra's excellent new 5th-edition one give loads worked up in Model 1896 rifles. How to know if a given load is safe? Any load giving stiff extraction should be lowered by 2 or 3 grains; loads made up with neck sizing only whose cases rechamber easily after five or six reloadings probably are safe; and loads using powders of 4350 burning rate, or slower, giving less than 2,550 ft/sec also probably are safe. My rifle shoots sub-MOA with Norma's 130-grain boat-tail match bullet, 140-grain Lapua Scenars and 142-grain Sierra match bullets. Remington's 140-grain softpoints are good only for offhand practice. I've gotten excellent accuracy from Hodgdon's H414, Alliant Re19 and Vihtavuori N160 and N560 powders, but the 6.5X55 case seems to work well with any and all slow-burning powders. Some shooters find that mild loads, pushing the 130-142-grain bullets less than 2,600 ft/sec, are more accurate than near-max ones. Lapua's cases are some of the best I've ever used; Norma's also are good; but Winchester's measure only 0.4715 to 0.472 inches at the head and their primer pockets tend to loosen after four or five loads. Redding dies have worked well for me, along with a K&M priming tool (both **PS** advertisers). Changing the Lee shell holders (a special one is needed for the 0.477-inch Swede case head) in the K&M tool is quickly done. Not only is the 6.5X55 case easy to reload, but Swedish match shooters typically put about 4,000 rounds through a barrel before replacing it.

The Swedish Mauser and its cartridge are a part of history—developed before the Spanish-American War and the Alaska Gold Rush, used very seriously by some Finns and Norwegians against their enemies in the early to middle 1940's, a major factor in northern European rifle competition and big game hunting for three generations, and now giving many of us an inexpensive yet accurate-shooting rifle for the 21st century. My Swede Mauser really is more fun than that Krag sporter—Pete, you can have it!



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Bore Capacity Revisited—

Part 1 A USER-FRIENDLY GUIDE

BY JOHN DUSTIN

(Editor's note: The majority of this article first appeared in the *'97 Precision Shooting Annual.* What with the advent of Long Ultra-Mags, Short Ultra-Mags, Ultra-short Ultra-Mags, plus a variety of Proprietary-Mags and a whole new crop of old-fashioned Belted Mags, we decided it was time to send Mr. Dustin back to the internal ballistics dungeon with strict instructions not to re-emerge until an update was in hand. Herewith the results, delivered in three parts.)

Part 1

I was a confirmed shooter and handloader well before my graduation from high school. As the time for selecting a college drew nigh, I negotiated (under rather rancorous conditions) an understanding with my father: I would be permitted to attend the School of Gunsmithing at Lassen College, provided that I also carried a full academic load which would permit my transfer to a business school upon completing the gunsmithing curriculum.

That innocent era (the mid-60s) coincided with the halcyon days of the high capacity magnum rifle cartridge. .300 and 7mm magnums were being sold right and left, and there were nearly as many .257s and .264s. If you weren't shooting something with a belt on it, by God, you were dealing with second rate stuff! I well remember one fellow student's prized hunting rifle, a 7 Mag on a commercial FN action, lovely claro walnut stock, rollover cheekpiece, pencil-thin 22" barrel, more bells and whistles than a fire engine. Touch that baby off, and the ground reverberated. It had to be making 3500 feet per second, at least! Conveniently, this was the period before something called a chronograph came into wide circulation.

Toward the end of my sojourn at Lassen, I acquired a set of Parker Ackley's *Handbooks for Shooters and Reloaders.* I was after the reloading data (now rendered obsolete by changes in powder), but as I ventured further into the text, I grew flabbergasted by Ackley's frequent railings against "over-bore cartridges"... he actually thought that there was such a thing as too much powder! If it had come from a lesser authority, blasphemy would have been declared and a lynch mob assembled. As it was, we were obliged to sit up and take notice. P.O. had gone so far as to conduct tests, using a chronograph and the same barrel, but cutting new chambers over the course of the experiment, measuring the results of increased powder capacity. Our eyes were opened a sliver (those of us who styled ourselves "experts"), but the boys from Madison Avenue didn't miss a beat. Slick, four-color ads continued to propound the virtues of large capacity cases, and shooters in droves continued to buy.

Within a decade, chronographs began to be widely available and a remarkable phenomenon was observed: factory ballistic tables on many high intensity cartridges were revised, reflecting substantially reduced muzzle velocities! Some of this probably resulted from the ministrations of the various legal departments, but doubtless much of it was the product of reality catching up with advertising copy.

Meanwhile, the Gnomes of Nitro-cellulose continued with their dark alchemy. Old standards such as HiVel #2 disappeared, while mainstays such as DuPont's 4064 seemed to become more dense, while maintaining their prior burning rates. New powders were being developed which were both slower in initial burning rate and more progressive later on in the burn. These new offerings seemed particularly well suited to our old friends, the "over-bore" magnums.

What changes have 30+ years of evolution wrought in the old debate over bore capacity? I was determined to find out, and hoped during the process to develop some understandable and easily used methods which shooters could employ in formulating their cartridge/ barrel selections and load development.

Homer S. Powley, whom I think of as the father of modern small arms ballistics, developed the notion of the "expansion ratio". This, in essence is the relationship between case volume and total volume available for powder burn in any given cartridge/barrel combination. This is still a very useful concept and one from which we will borrow in the present analysis. I will concentrate on a permutation of this concept, which I term "effective expansion ratio" or EER. This is the ratio of volume of the powder charge actually used to the total volume available for powder burn. Unlike Expansion Ratio, it accounts for the greatly varying

Continued on next page

Bore Capacity Revisited–A User-Friendly Guide: Part 1

Continued

densities with which cartridges can be loaded. These ratios can be accurately employed to prognosticate the efficiency with which any particular cartridge will burn powder.

An essential part of calculating both ER and EER for any given loading is accurately determining the volume of the cartridge case. Many ballisticians have expressed case volumes in terms of grains of water. I was reluctant to follow this course, since water's surface tension causes it to "bead up" and otherwise behave badly, especially in narrow constrictions (such as case necks). My adopted method for measuring case volume began with a small test lot of fine grained ball powder (I used AA2230), which was set aside in a separate opaque jar having a tight lid. Powder of this type flows almost like a liquid and meters with great uniformity—desirable qualities for this exercise. I then located a rather small, rigid plastic jar, about the size of a 35mm film canister, constructed such that it's interior volume could be very accurately measured (it turned out to be 1.9026 cubic inches). This jar was filled numerous times with the test lot of powder, without compression or vibration, and leveled off with a straight edge, with the resulting powder weight recorded. The extreme spread of recorded weights was about 1/2 of 1%, and provided a mean of 247.0 grains of AA2230 per cubic inch. Any small grain ball powder is suitable for this test—just be sure you use a controlled sampling set aside in a tight fitting container, and don't use dirty brass. Simply plug the flash hole tightly and weigh at least three charges (full to the case mouth), with any anomalous reading discarded. Dividing the average weight by the weight per cubic inch of the powder will give you the case capacity in cubic inches.

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I performed this exercise on a wide variety of cases, each of which was first weighed, with the following results:

Case/Manufacturer	Case Weight	Charge Weight	Case Volume (C.I.)
.223/Lake City	93.3	29.3	.1186
.223/Win	91.9	29.4	.1190
6x47/Rem	93.6	31.1	.1259
6PPC/Sako	119.0	31.4	.1271
6BR/Norma	126.4	36.7	.1486
.25-06/Fed	182.8	65.7	.2660
.260 Rem/Win (.308)	163.1	53.5	.2166
6.5 Rem Mag/Rem	214.0	68.0	.2753
.270 Win/PMC	193.5	66.1	.2676
7mm/08 Rem/Rem	163.2	54.1	.2190
.280 Rem/Rem	199.8	68.0	.2753
.284 Win/Win	191.2	66.1	.2676
7mm Rem Mag/Fed	233.1	85.3	.3453
.308 Win/Win	265.7	54.5	.2206
.30-06 /Fed	198.1	66.3	.2684
.300 Win Mag/Win	232.5	90.4	.3660
.300 Wby Mag/Wby	221.1	104.0	.4211
.300 WSM/Win	230.5	81.8	.3312
.300 Ultra-Mag/Rem	272.3	115.4	.4672
.338 Win Mag/Rem	233.6	87.0	.3522
.338 Lapua/Norma	331.7	112.9	.4571
.375 Ultra-Mag/Rem	270.3	117.2	.4745
.416 Rigby	327.3	132.7	.5372

For our next step in the process, we need not pour each barrel full of powder—the volume of a cylinder can accurately be determined mathematically. Since we are not all mathematicians, I'll stay away from algebraic formulas and present the computations in a step-by-step format:

1. Measure the length of the barrel from bolt face to crown.
2. Subtract the case length from the above to indicate **effective barrel length.**
3. Average the bore and groove diameter of the barrel and add .0015 to .002 to bring you an even 3 digit number (remember that grooves are generally wider than lands). Divide this number by 2 (e.g., .270 +.277 = .547, divided 2 = .2735, plus .0015 = .275, divided again by 2 = .1375).
4. Multiply this number by itself (e.g., .1375 x .1375 = **.018906**), then multiply this number by pi (3.01416). This will give you the barrel volume per inch, expressed in cubic inches (e.g., .0189066 x 3.1416 = **.059395** cubic inches per inch of a .270 Winchester barrel).

We're now in a position to calculate total cartridge/barrel volume. Sticking with the example of a .270 Winchester having a barrel of, say, 24", the additional steps are as follows:

5. 24' barrel length less 2.54" case length equals an effective barrel length of **21.46".**
6. 21.46 x .059395 = **1.2746 cubic inches.**
7. 1.2746 + .2676 (see prior data for .270 Win) = **1.5422 cubic inches total.**

I promised that this would be a user-friendly guide, so for those folks who wish to assess their own unique cartridge/barrel combinations. Let's back up a minute and provide a bore volume summary for most rifle calibers presently in use:

In order to get a rifle's EER, consideration must be given as well to the volume of the powder. Common rifle powders vary significantly in terms of normal density. By arbitrarily selecting and testing several different powders, I generated a range of 186.1 to 249.7 grains per cubic inch. This is somewhat deceptive, however, since granule size and configuration vary widely, as does the "hole" that runs through canister powders.

In order to effectively eliminate air space from my calculations, I took a very dense ball powder (H335), and carefully determined it's normal weight per cubic inch (249.7 grains). I then seated a spent primer upside down in a sized .44 Mag case, and filled the case almost to the top with H335, such that the base of a 300 grain jacket bullet would just touch the brass without compressing the powder. I then seated the bullet on top of this powder charge with great force, such that the bullet tip was significantly distorted in the process. By measuring the obtained seating depth under magnification (measuring cannelure to case dimensions before and after), I determined that H335 under maximum practical compression is 12.84% more dense than in it's normal uncompressed state.

For purposes of these investigations, then, all smokeless powder will be deemed to have a density **absent significant air space** of 282 grains per cubic inch. This standard will provide more than enough accuracy and sensitivity for our current purposes. Note that a solid plug of smokeless powder will have a higher density, however this is never duplicated in a loading room and so is not considered here.

Let's revisit our .270 Winchester with a 24" barrel. Our loading label says we are using 56 grains of IMR 4350 behind a 130 grain bullet. The volume of the powder charge is **.1986 cubic inch** (56 divided by 282). Our prior calculations gave us the total bore capacity of **1.5422 cubic inches.** Thus:

$$\frac{1.5422}{.1986} = 7.765$$

The rifle/cartridge combination has an Effective Expansion Ratio of 7.765 to 1, signifying that the powder (and powder gasses) can expand to 7.765 times their original volume before their work is done. Empirical evidence gained over decades tells us that this is reasonably efficient loading, which will produce relatively long barrel life and good downrange performance, with an initial velocity of about 3000 feet per second. Muzzle energy of 2599 foot pounds is equivalent to 46.41 foot pounds per grain of powder.

Now let's have a look at a couple of other rifles, each of which has a similar potential use as our .270. The first of these is a .257 Weatherby Magnum, whose owner values a flat trajectory very highly. He doesn't mind its 26" barrel and all-up weight of nearly 10 pounds. To get maximum velocity with the 120 grain boattails he shoots, he knows he has to use a large charge of very slow powder, and has settled on 67 grains of RL22, which is good for 3200 feet per second. Case volume with this lot of brass is .3375 cubic inches and his calculated barrel volume is 1.1975 cubic inches, for a total of 1.5351. Compressed powder volume is .2376 C.I. (67 divided by 282) leading to

Continued on next page

Volume (in cubic inches)	Per Lineal Inch of Barrel
.22 Rimfire	.038360
.22 Centerfire	.038708
6mm	.045617
.25	.051071
6.5mm	.053913
.270	.059395
7mm	.062458
.30	.073542
8mm	.080928
.338	.088668
.35	.098980
.375	.109272
.45	.163313

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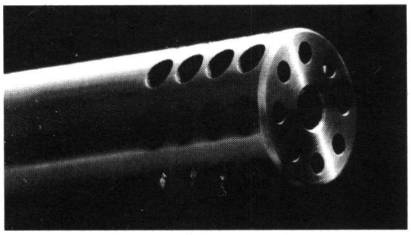

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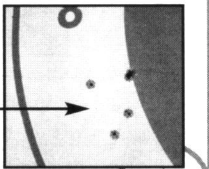

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Bore Capacity Revisited–A User-Friendly Guide: Part 1

Continued

the following summary equation

$$\frac{1.5351}{.2376} = .6461 \text{ EER}$$

The muzzle energy for this rifle/load combination is up slightly from the .270 at 2729 foot pounds, or 40.73 foot pounds per grain of powder.

The third rifle is a 7mm/08, whose owner values modest recoil and portability. It is built on a short action with a 23" barrel, and she can carry it comfortably in all kinds of terrain. She recognized she would have to give up a little velocity compared to some other cartridges, but has been pleased with the rifle's performance under a variety of conditions. Her load is 44 grains of Varget behind a 140 grain boattail, which is good for 2850 feet per second and a muzzle energy of 2526 foot pounds, close on the heels of the .270. Case volume is .219 cubic inches. Accordingly, the EER calculation looks like this:

$$\frac{1.528}{44/282} = 9.793$$

Muzzle energy per grain of powder is 57.41.

Let's display the profiles of the three rifle/load combinations in tabular format (1.5" scope height and 250 yard zero in all cases):

	7mm/08	.270 Win	.257 Wby Mag
Total combustion volume (C.I.)	1.5280	1.5422	1.5351
Powder Charge (Gr.)	44	56	67
EER	9.793	7.765	6.461
Muzzle Energy (Foot Pounds)	2526	2599	2729
Energy @ 500 Yards	1046	1090	1143
Point of Impact @ 150 Yards	+3.35"	+2.93"	+2.51"
Point of Impact @ 500 Yards	-38.87"	-34.74"	-30.42"

There are some interesting things to note here. One of these is the similarity among the total combustion volumes of the three examples... It appears that there is a close correlation between combustion volume and energy, much more so than between powder charge and energy. The .257 Weatherby does indeed shoot flatter and generate more energy than the other two (8" less drop at 500 yards compared to the 7mm-08, and 8% more energy). However it takes 50% more powder and a longer heavier rifle to do so. Another factor is barrel life. Silhouette competition over many years now has shown that the typical 7mm/08 barrel will provide some 3000 rounds of good accuracy. Barrels for cartridges such as the Weatherby are typically gone inside 1000 rounds. The importance of this factor varies widely, according to the needs of the individual shooter.

Discussion of Effective Expansion ratios requires consideration of one additional point: the length of the barrel in which it is calculated. A 40" .257 Weatherby barrel has about the same EER as a 24" .338 Winchester barrel, but the former is an utterly impractical configuration that is never seen. Our custom barrel makers offer no standard barrel blanks above 30" in regular rifle calibers, and most go out at 28" or less. Thus, EER calculations should be limited to barrels of 28" or less, with an exception for specialized applications such as "rail guns" or .50 BMG pieces.

To be continued...

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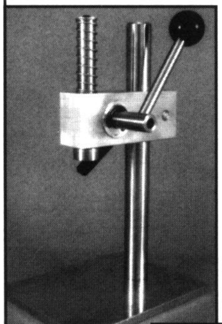

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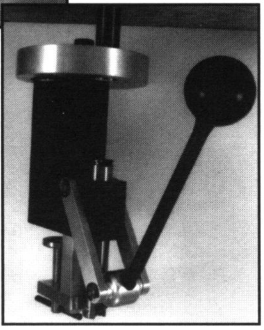

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Now You Hear Me, Now You DON'T....

BY STEVE BAUGHMAN

Up until the Industrial Revolution, the consciousness of hearing protection was unknown. Nature produced very few noises that damaged the human ear. It wasn't until the introduction of gunpowder, machinery, and industrial manufacturing that the damage to the human ear started. When I started shooting around 35 years ago, hearing protection was virtually unheard of. It was totally unheard of when my father started shooting 35 years earlier than that. As a kid, when my father took me out for an afternoon of shooting, my complaints of the ringing and pain in my ear were basically explained as a fact of life if one is going to shoot guns. The only "remedy" provided was cotton balls, rolled up and stuffed into my ears. When my father was a kid and complained about ear pain there was no remedy provided at all, except words perhaps such as: *"Suck it up boy, your ears will toughen up"*. Unbeknownst at the time, the human ear is not capable of toughening up to protect itself from loud impulse noise, and hearing damage most certainly occurred. The U.S. Military only started using hearing protection in the late 1960's, and hearing protection devices have only been widely used by sportsmen since the early 1970's. We've come a long way now with regards to both hearing protection equipment, and the awareness and knowledge base as to why they are so important for those who shoot, or for those who are around others who shoot.

Hearing damage from gunfire is almost completely avoidable simply by properly wearing Hearing Protection Devices (HPDs) as my Safety Engineering friends tell me they are called. HPDs come in a variety of types and designs, and I will review those types herein and hopefully provide you with the information you need to make an intelligent choice with regards to which types are right for you and your shooting style. Dr. William Kramer, a shooter himself, and author of the book *Gunfire Noise and Hearing Protection*, estimates 50 million shooters in the United States are currently at risk of experiencing noise-induced hearing loss during their lifetime. Hearing loss is typically the type of thing that you don't think will happen to you; so therefore, many feel that there's no need to worry about it. In a similar vein, nobody expects to experience being involved in an automobile accident today either, but it happens every single day to *someone.*

The dynamics of hearing damage resulting from gunfire noise is fairly straight forward and easy to understand. Hearing loss is progressive over time, and typically comes in small increments. It is not inflicted upon the actual eardrum itself, but upon the tiny hair cells (cilia) up in the inner ear. The ear consists of outer, middle, and inner ear sections. Sound waves funnel themselves through the outer ear into the ear canal and strike the eardrum itself, causing it to vibrate. There are three small bones in the middle ear which pick up these vibrations, and transmit them to the cochlea, which include the tiny hair cells. These hair cells produce electrical impulses, which are then picked up by the auditory nerve and sent on to the brain. Hearing experts generally agree that every time the ear is subjected to a continuing noise level in excess of around 85-90 dB, the sound waves reaching the inner ear batter the hair cells in the cochlea. The nerve endings are damaged and/or destroyed, resulting in some reduction and loss of hearing to the individual. This hearing damage is permanent, as the nerve endings do not regenerate themselves.

As the years roll by, age related hearing loss, in combination with impulse noise damage is usually undetected by the individual until it gets to the point that you (or others) notice small indications that there is something wrong. Usually, it becomes noticeable when you find you are unable to interpret when others are talking to you under certain conditions. The medical term for this type of damage is Gradual Hearing Loss or GHL for short. GHL can also be accompanied by the development of ringing in the ears. Ringing in the ears, or tinnitus, was common for me personally when I shot in my younger years. Usually the ringing would go away after a couple of hours when the shooting activity stopped, while at other times, it lasted several days. There are cases when tinnitus does not go away. The worse case is when it is present 24 hours a day, 7 days a week, 365 days a year. That is a condition certain people have to live with for the rest of their life, and is not a pleasant condition to be in. It's so much safer and easier to use hearing protection each and every time you participate in shooting activities to protect your

Continued on next page

Now You Hear Me, Now You Don't....

Continued

hearing. With the current technology available, everyone from the hunter to the plinker to the competitive shooter should be wearing HPDs. It's never too late to start no matter what condition you currently find yourself in with regards to hearing loss. In the long run, you'll save what hearing you currently have.

For those who want to delve into the science of sound measurement and noise limits, a good starting point is Mil-Std-1474D. This Military Standard is the Department of Defense Design Criteria Standard for noise limits. The standard establishes acoustical noise limits for a variety of environments, and prescribes testing requirement techniques for determining conformance to noise limits. It's a good read for those who like to delve into the science end of it. It explains the difference between steady-state and impulse type noise. To summarize a few key points, it is generally understood that recommending noise level exposure boils down to the type of noise and exposure time to it. When it comes to steady-state noise, anything over 85dB is considered bad. With regards to impulse noise, anything exceeding 140dB is bad. Anything over 140dB requires the use of hearing protection for any number of exposures per day. Due to the extremely short duration of impulse noise, the human body can take a lot more repetitive exposure to it than the same level if it were steady-state.

Time duration is the key factor on determining and preventing hearing damage. OSHA requirements for industrial exposure in the workplace state that hearing protection must be used if the sustained sound level is above 85dB. This number is based on assumption of an exposure of 85dB every day, 40 hours per week, for the entire work year. Further complications surface due to the nature of sound. Sound itself is sometimes hard to understand with regards to comprehending its measurement. It's something you can't see, yet we react to it based on its loudness or quietness as measured by our hearing. Sound is quantitatively measured in units of decibel (dB), and frequency (Hz). Loudness is measured in decibels on a logarithmic scale starting at 0, which is the threshold of hearing. Each 3 dB increase in sound level is an actual doubling of the sound pressure level. If that 85 dB mentioned above is an acceptable dose of sound in a work year based on 2,080 hours, raising that number to 88 dB (or 3 dB more) cuts that acceptable exposure time in half.

Impulse noises, like gunshots, are unique due to their extremely short duration. The pain threshold of most individuals is about 140 dB. The key for the shooter is to choose a HPD with a noise reduction rating adequate to lower the level of the sound that reaches the inner ear. Since the sound produced by a firearm is considered an impulse sound, it is defined as having a duration or length of less than one second. Because of this, the ear is less sensitive in perceiving the actual loudness. Although the perception of the loudness is less with an impulse sound, the risk of hearing damage is not reduced. The risk of noise induced hearing loss depends on total exposure, that being the combination of noise level and noise duration. As the firearm gets louder, the number of permissible exposure events is reduced. An example is a 9mm handgun producing 160 dB noise levels. That level of noise exposes the shooter to reach the OSHA yearly recommended equivalent in only 7 rounds fired.

Both OSHA standards and Mil-Std-1474D state that hearing protection must be used if the sound pressure levels are 140 dB or greater for impact noise. This 140 dB noise level is a key number to be aware of. Take for example, an M-16 carbine that produces noise levels of 168 dB. The key is to use adequate hearing protection to reduce that noise level down to 140 dB (or below). Using the same logic and accepted practice from OSHA and Mil-Std-1474D, as long as the noise levels remain at 140 dB or below, an individual could shoot 17,000 rounds per year and still be considered safe.

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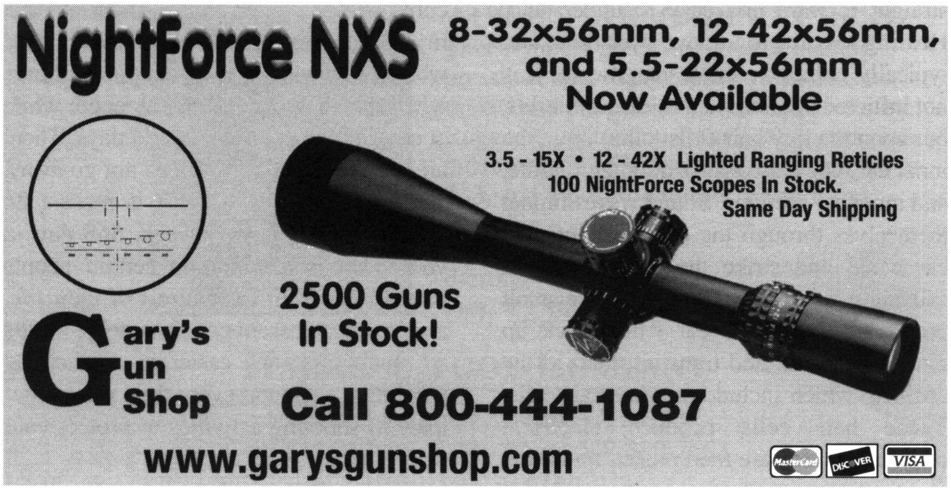
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main measuring tool to be aware of when choosing an HPD. The NRR is the measure of noise reduction the device provides across the entire spectrum of heard noise. It is the rating scale set up by the Environmental Protection Agency, and is considered a guideline for the amount of protection an HPD will give. A hearing protection device's NRR is generated in the laboratory using continuous sustained tones, since industrial applications are the main drivers for establishing NRRs. Research has shown that HPDs work significantly better against impulse noise than against continuous noise. Also remember that distance from the sound source is a factor. A longer barrel length will put the muzzle blast that much further away from the ears, and is also a factor for consideration. Some tests however, indicate that the noise levels at the shooter's ear are only 1 to 2 dB less than as measured at the muzzle. Typically, a firearm's loudness is measured by established industry standards established in Mil-Std-1474D, with a sound meter's microphone set one foot away from the muzzle at 90 degrees to the bore axis and 1.6 meters above grass covered ground. The equipment must meet specific requirements, and are not of the typical Radio Shack variety. Most firearms produce impulse noise levels above 140 dB. Some typical gunfire noise levels are shown below*:

.22LR Noise Levels:
157 dB Beretta 70s
159 dB Walther PPK/s
152 dB Ruger 5.5" MK2
141 dB Ruger 10/22
139 dB Ruger 77/22 (20" bbl)

.380 Noise Levels:
160 dB Ingram/MAC M11 (PS)
160 dB Walther PPK

9mm Noise Levels:
160 dB Beretta M9

.45ACP Noise Levels:
163 dB SIG P220

.223 Noise Levels:
168 dB M4 carbine, M-193 ball ammo
165 dB M4 Carbine, SS-109/M855 Ball

* Data courtesy of Dr. Philip H. Dater of Gemtech (www.gem-tech.com). Dr. Dater is a licensed physician and retired diagnostic radiologist. He is considered an industry authority in the fields of telecommunications, silencer design and manufacturing. This author would like to thank Dr. Dater for his contributions to the information contained within this article and for his sharing of information on this important topic.

To deal with this exposure danger, HPDs are obviously recommended for anyone who shoots firearms. HPD's are classified as Passive and/or Electronic.

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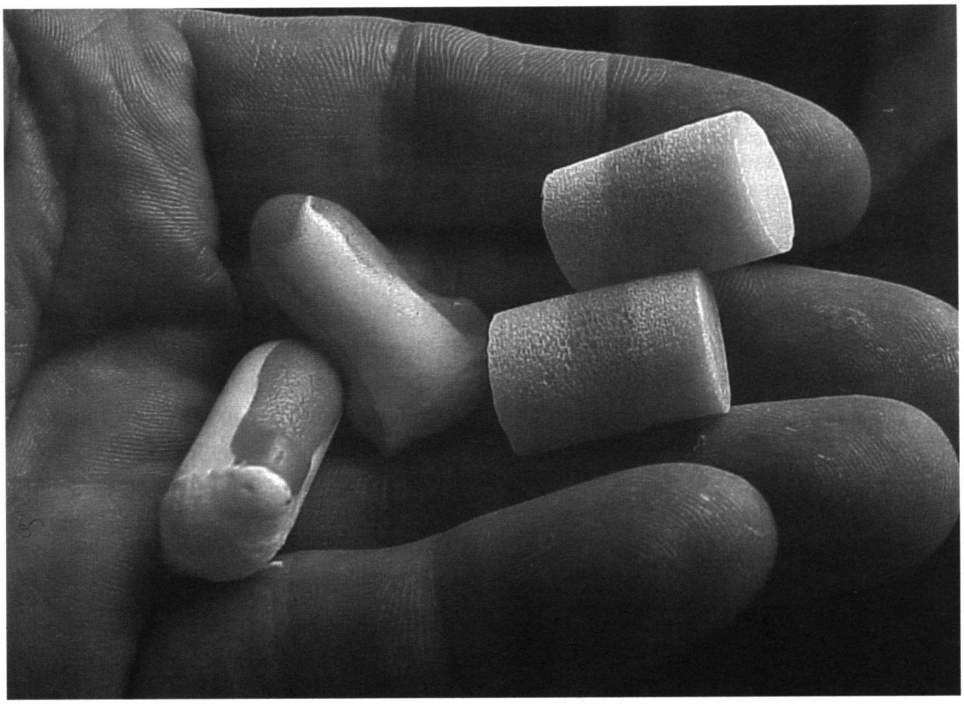

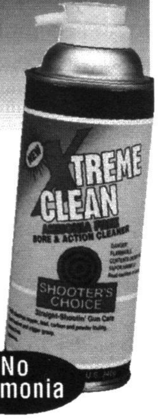

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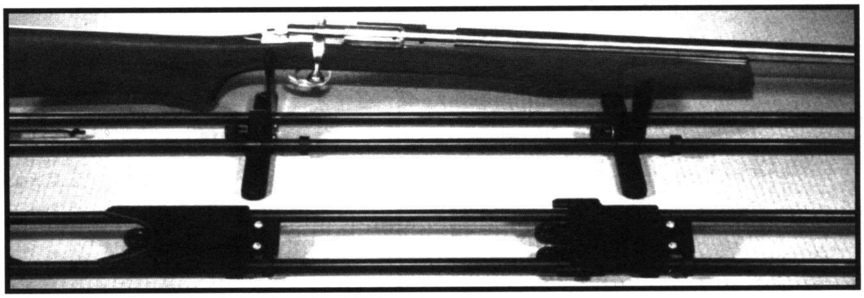

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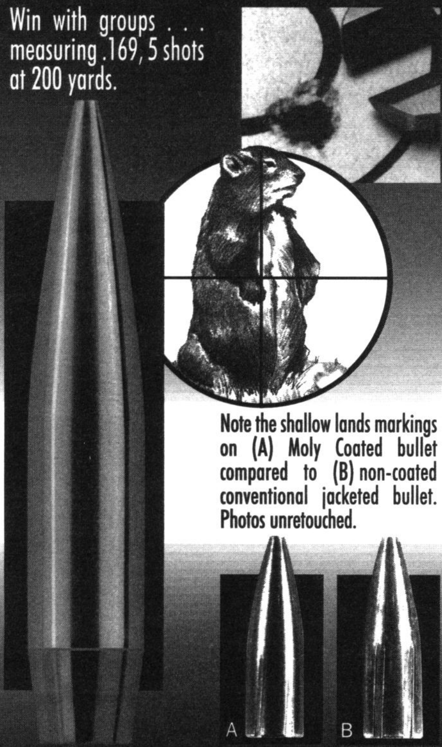

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Now You Hear Me, Now You Don't....

Continued

There are many excellent designs on the market today. Basically, they are mechanical barriers of some sort. Passive HPDs such as foam plugs are cheap, and advertise NRRs of 33 or so. They are easy to carry and are normally disposable. Obviously, the most NRR one can achieve would be to wear both plugs and muffs at the same time, with muff type devices usually being superior to the plug types. There is another factor that works against the shooter, and that is bone conduction. The bones in the base of the skull actually allow transmission of noise to reach the cochlea. In-the-ear devices can reduce the sound levels reaching the tympanic membrane in the ear by 10-12 dB. At this point, one hears ambient noises primarily by the bone conduction phenomenon. Quality muff-type HPDs typically reduce sound levels by 22-28 dB, including the bone conduction pathway. One would think you can add both NRR's together to get a total NRR rating way up there, but that's not quite how it works. Typically, using both foam plugs and muff in combination can provide around perhaps 3 dB more protection than using either type alone.

Next up the line are custom fit solid earplugs, which are made from a mold of your ear. They provide an exact impression of the ear cavity. These types of plugs take the guesswork out of ensuring that the plugs are adequately positioned in the ear to do their work. Since they are custom fit, they do the hearing reduction work the same, every single time they are used. They are also the most comfortable of all types discussed herein. Electronic Shooters Protection (E.S.P.) in Brighton, Colorado provides an excellent variety for those who want to protect their hearing while maintaining ultimate comfort and convenience. E.S.P. also specializes in manufacturing solid earplugs that contain the noise cutoff circuitry as found in larger electronic devices. These types of devices cost significantly more than the plain-jane variety.

The last type of passive level HPD discussed herein is the standard earmuff, and is probably the most popular. Usually held in place by an adjustable headband, they provide an air seal over the entire ear if worn correctly, blocking out noise from entering the inner ear. Muffs offer good protection and are easy to use. One must ensure that the muff provide a tight seal against the head, and are not placed over glasses, ball caps, etc. as that negates the effectiveness of the unit. They will not get in the way when shooting a handgun, but can sometimes get in the way when shooting a long gun. The manufacturers have been aware of this for some time, and provide slim-line models that increase the clearance between the muffs and the gunstock.

The introduction of electronic HPDs has had tremendous impact on the shooter's comfort. The typical electronic HPD amplifies low noises, yet blocks out noises that reach above a sound level of about 90 dB. They accomplish this by incorporating noise cutoff circuitry in the device. One can carry on a normal conversation while

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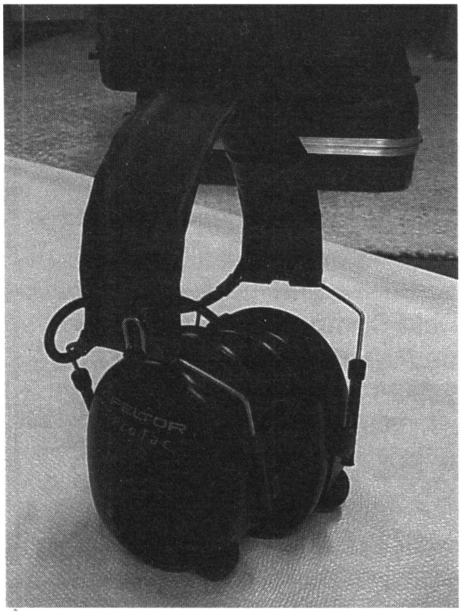
wearing them, yet have the protection needed when the noise spike of the gunshot occurs. They are especially beneficial to the range officer, allowing one to hear low-level noises while protecting the ears when the gun is firing. They are also ideal for the hunter since they will amplify quiet noises in the woods, and still protect the ear when the shot is fired. Probably the ultimate "in-the-ear" electronic HPD is available from E.S.P. They incorporate circuitry that fits in the ear and are ideal for anyone who is bothered by the bulkiness of the muff type units. Another excellent brand is Walker's Game Ear. The Game Ear is lightweight and fits directly behind the exterior ear lobe. They make a variety of models for almost every need and are a great value for the money. I use the Game Ear II when hunting, and find it is very comfortable and easy to use. It has adjustable frequency capability, so the unit can be tuned for clear reception in different situations. It amplifies high frequency sounds up to 7 times to enhance a hunter's ability to hear surrounding noises, yet has compression circuitry to protect the ear during a gunshot. Compactness and light weight are two of the Game Ear benefits. I highly recommend it for hunters who are not normally firing a lot of rounds during a typical day in the field.

One might wonder about the ability of the electronic HPD to be able to be fast enough to cut out the sound of a gun firing. It's commonly called "attack time", and is the time it takes for the circuitry to react to loud noises. The higher priced units typically have the fastest attack times, where they go into the compression mode in a single millisecond. Lower priced units feature a slower reaction time of around 8 milliseconds. It's not much of a difference, but it is enough to let in some noise penetration. A typical single gunshot begins and finishes in less than 1 second, with peak impulse noises occurring at about 30 microseconds. Like most things, you get what you pay for, and this is typically true for electronic HPDs.



In my sometimes role as a law enforcement firearms instructor, I've been exposed to a lot of gunfire noise. For my personal HPD choices, the Peltor ProTac works best for me. The ProTac provides good noise reduction across a broad range of noise frequencies. This unit has simple push-button on/off and volume controls on the right side for controlling full-stereo sound amplification of low noises. The ProTac switches off automatically two hours after the last sound is registered, so it saves batteries if one forgets to turn off the unit. Its sound cutoff kicks in when the noise rises above 82 dB. Battery life for its two

Continued on next page

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Now You Hear Me, Now You Don't....

Continued

AA's is rated at 270 hours. It is very comfortable to wear all day long. It also has electronic sound cutoff, so I can protect my hearing yet be able to hear normal conversation with shooters on the firing line. I feel it provides an added bit of safety factor while on the range, allowing me to hear normal conversation and communicate easily with other instructors. The unit's snap-in ear cushions are replaceable, and the manufacturer recommends their replacement twice a year. Since most of my shooting involves handguns typically, the ProTac works very well for me.

Costs for hearing protection can run from less than a dollar, all the way up to $2000+ for a high-end unit. Remember that if you invest in one of the more expensive units, it will be with you for a long time, whereas the lower end units typically don't last as long and are not as durable. Comfort and convenience are also other factors to weigh in on when deciding on what kind to get. No matter what you get, get *something*, as it's better to have any kind of hearing protection than none at all. Generally speaking, anything providing a noise reduction of 25 dB will be adequate for almost every situation you might encounter. Your hearing is something you share with other people every day, and it's a sensory function we all take for granted until it is gone.

Despite the sometimes negative stigma associated with silencers, or better called suppressors, I advocate their use where applicable. It's unfortunate that they require regulation under the National Firearms Act, and we can't get them into common use for the sake of saving our hearing. One can shoot a quality suppressed 22 rifle all day long without any type of hearing protection provided the proper ammunition is used. Many suppressed .22 long rifle pistols and rifles will produce sound levels from 110 dB to 125 dB. A suppressed .30 caliber rifle will reach into the low 130's. Some European countries, such as Finland actually encourage the use of suppressors to protect the shooters hearing, as well as control "noise pollution". An M16 rifle mentioned above in the tables, when equipped with a quality sound suppressor, produces a noise rating of about 130 dB. Combine that, with the use of hearing protection, and that becomes downright manageable. I routinely use sound suppressors for 9mm and .223 carbines, as well as .22 rifle and pistols. There are many manufacturers who fabricate quality sound suppressors for civilian and law enforcement uses. I currently use suppressors made by Gemtech, American Manufacturing, and Sound Technology. Their contact information is listed at the end of this article for those who are interested in exploring the world of sound suppression.

Over the last 10 years or so, the implementation of muzzle brakes and the like has increased dramatically. These devices are regularly offered direct from firearm manufacturers, or as aftermarket products. With their increased use, an increase of noise levels has been a byproduct. The benefits of reduced recoil and muzzle rise are admirable; however, the noise pollution is a problem. Know that if you use a firearm with a muzzle brake or barrel porting, be aware of the noise issues that require you to protect yourself and others around you. Generally speaking, and depending upon the design, a muzzle brake will add 5-8 dB to the noise level generated by the gun.

Common sense hearing protection basically boils down to this:

1. **Know** your hazard, and be aware of the sound levels you will be around. Use published data that are available as guidelines for choosing what type of hearing protection you may need.
2. **Select** a hearing protection product that is right for you. Take into consideration the comfort levels you desire, and be aware of the duration of time you will need to wear it. Be aware of the portability and storage factors, and the compatibility with eyewear and eye protection.
3. **Wear** your protection correctly! Each type is different, so be aware of how it is supposed to be worn.

Don't let the NRR numbers make you crazy. Remember that these numbers are to be used as general guidelines for selecting the appropriate device for your needs. Also remember that sound is absorbed in the air as it travels through it. Wind, barriers and enclosures, the ground, and distance all act to reflect and absorb sound with respect to its distance from the source. Examples are

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obvious when comparing shooting over concrete vs. grass covered ground. Concrete acts like a reflector of sound, and the ground usually absorbs it. The time of exposure to noise is also a critical factor. The longer the exposure time to loud noises, the greater the risk to the individual.

While carousing the 2003 SHOT Show in Orlando, I stopped by every single hearing protection related company and booth I could find. I learned a lot with regards to the differences between manufacturers and the variety that is out there with regards to HPDs. Some of these manufacturers are listed as sources at the end of this article. One interesting unit that I took note of was the "solar powered" electronic units from A.V. Electronics. Their unit recharges the internal battery just by being out in the sunlight. The SHOT Show allowed a forum where I could test each unit for comfort and sound amplification quality. There were some surprising differences between the brands with regards to sound quality. When selecting a HPD for purchase, don't forget to consider the warranty. Most electronic devices are quite durable, and don't typically require having to send the units back to the factory for repair, but be aware that the electronic units contain sensitive components. Most manufacturers offer a one-year warranty. Pro Ears however, seems to have upped the ante, and now have a five-year warranty on their units.

A few years back, when my father's hearing was failing, it got to the point where he could not hear anything anybody said to him. He finally got a set of electronic hearing aids. They amplify existing sound so he can hear and converse with people. They are not without fault, and in crowded and noisy places, are virtually unusable. If you were to ask him, he would tell you that when he was a kid and growing up, they knew absolutely nothing about the damage they were doing when they went shooting. He wishes they had, because once the hearing goes, it's gone for good. Hearing loss has a detrimental impact on one's life and work, and isolates the individual to some degree.

I hope the above synopsis is a primer that leads you to reconsider, or to consider what your options are when it comes to protecting your hearing. Now you know the basics of how hearing loss occurs, I hope you'd agree to not leave home without your HPDs. Your ears will appreciate it, and so will your family.

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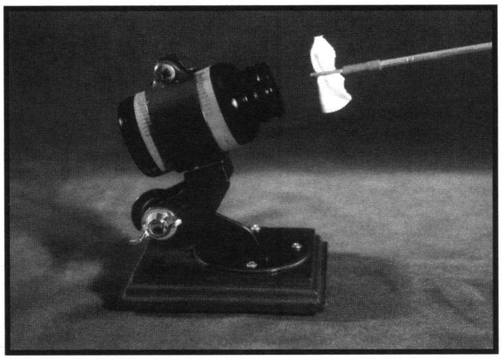

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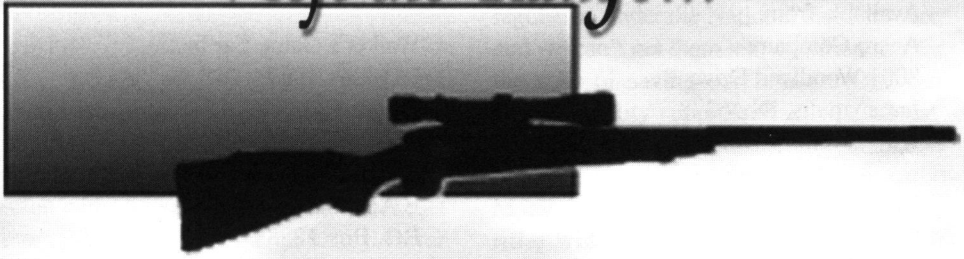

Joe Rychetnik

"Bush Cop"

On March 5th, 2003, Joe Rychetnik left our midst and went on ahead of us. Exactly just how the word of his death got out so quickly and so widely we don't know, but our phone here at **PS** rang off the wall, with callers about evenly divided between those who were simply trying to confirm the sad news, and those who called to express their sympathy for our loss.

Joe was born in Chicago, in 1927. When World War II came along he joined the Marines, and eventually found himself on a fuel and ammo loaded ship under kamikaze attack off Iwo Jima. During the Korean War he was a Marine combat photographer. Following that war Joe graduated from the University of Nevada-Reno with a degree in journalism and went to work for United Press International as a photographer and writer. Later he moved to Alaska together with his young family and was one of the first to join the newly formed Alaska State Police. He patrolled the northwestern coast of Alaska, from Barrow to Bethel, in bush planes, skin boats and dog sleds, completely on his own, with the nearest possible law enforcement assistance hundreds of miles away. That sort of a job description just naturally called for a somewhat free-wheeling style of law enforcement, and Joe was up to the task. Fortunately a world less concerned about political correctness back in those days was more understanding about free-wheeling…if the miscreant got a gun barrel over the head…well, he must have asked for it. This period in Joe's life was the subject of his first book, *Bush Cop*, published in 1991.

After four years with the State Police Joe went to work as a writer-photographer for Time-Life News Service, and United Press International. Once again his area of coverage was huge…the State of Alaska, to be exact. When there was a story "out there" Joe was expected to round up the nearest bush pilot and get out there wherever it was that the story was breaking. This put Joe in regular and close contact with another free-wheeling bunch…the early bush pilots of the Far North…many of whom have today passed into Alaskan folklore. This period in Joe's life was the subject of his second book, *Alaska's Sky Follies*, published in 1995.

Joe Rychetnik's obituary in an Alaskan newspaper described him as "A well-regarded photojournalist, raconteur, inspired letter writer, droll humorist, hunter, fisherman and Marine-for-life". Not a bad description! They then went on to say "An eager explorer and captivating storyteller, Joe had a lifelong love affair with good food and drink, great company and larger than life adventure. He collected and wrote about his passions: guns, knives, aviation, interesting people and his beloved Alaska. His hands were never far from a camera, a typewriter, a map or a cold glass of good local brew." Again, not a bad description of Joe Rychetnik!

Forgive us if we take the decidedly provincial view that Joe's third and last book, *Joe Rychetnik Reflects on Guns, Hunting and Days Gone By*, was his best (Precision Shooting was proud to have been the publisher of that work, a collection of thirty of Joe's best articles).

Our much-loved Resident Yarn-spinner and raconteur has left us, after a long final illness. He called us about six months ago, to tell us that his health was pretty bad, and we should not plan on seeing any more of his stories. It so happened that we'd heard this line from him two or three times previously, and each time, to his wonder and amazement, he had recovered. So we told him breezily to stop feeling sorry for himself, we'd heard all this before, so hurry up and get back to your writing desk as soon as you can. This time, unfortunately, Joe's intuition was better than ours.

At his request there was no funeral service. A tribute to his life will be held this summer in Alaska, and as he requested, his ashes will be scattered over Mount McKinley's Ruth Glacier ….fittingly, from a bush plane.

Rest in peace, Bush Cop.

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NEW Competition Scopes 35X, 40X, 45X - 45mm, Dot or CH, Black only	Cash price-879.99; Credit-899.99
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NEW 50 Cal. Flash Hole Uniformer	25.00
NEW 50 Cal. Complete Neck Turner	85.00
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We will fill Tuller bags with zicron sand

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243 Win	.35 ea
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7.64	.56 ea

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Euber 22/52 gr, 6mm/68 gr, per 500	92.50
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Fowler 6mm/66 gr, .	48.75/250 or 195.00/1000
Fowler 22 Cal 52 gr	48.75/250
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B.A.T. Actions	1120.00
Hall Actions PPC, 308	CALL
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Kelbly Swindlehurst Rimfire Action	1200.00
Kodiak Actions, PPC, 308	950.00
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Reloader 7/15/19/22/25 Avail in 5 lb. Kegs - 86.15 & 1 lb. Kegs - 17.65

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ALL IMR 8 LB. KEGS	124.95
ALL IMR 1 LB. KEGS	19.95
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Vihta Vuori 20N29 & 24N41, 8lb.	126.00
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NEW Wolf Gold	**974.00/case,**	**9.99/box**
NEW SK Standard Plus	207.00/case,	2.13/box
NEW SK Match	302.00/case,	3.44/box
NEW SK Match Gold	974.00/case,	9.99/box

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Standard Rifle	273.00/case,	2.81/box
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Match EPS	637.00/case,	6.54/box
Tenex Ultimate	910.00/case,	9.87/box
Remington Match EPS	556.00/case,	5.70/box
Club Extra	367.00/case,	3.77/box
Pistol Match	618.00/case,	6.35/box
Pistol Standard	273.00/case,	2.81/box
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Target 40 gr.	2.80

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Hollow Point	554.00/case,	5.69/box
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LV Stock - $323.95
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35X , 40X, 45X
Crosshair or Dot, Black Matte Only
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New Model. Lightweight version with flat on bottom rear of stock. Manufactured with graphite by McMillan to Bruno specifications. Average weight is 23 oz. Excellent for Light Varmint class. Will accept new Leupold scope with ease. Same contour and design as original model. Designed to ride the sand bags with limited torque & forend flex upon firing. Standard McMillan features: Solid fill construction, Molded-in colors, Available inlet for custom actions, in accordance with LV or HV Benchrest rules.

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200906 6x-50mm Plex	$ 404.67
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200934 6x-24x-50mm Ballistic MDot Matte TARGET/Side PA	662.03
200942 8x-32x-50mm Fine Plex Matte TARGET/Side PA	602.71
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200710 1.75x-5x Sig LRS Fast Plex Matte	$ 411.37

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200708 1.75x-5x Safari Taper Plex Matte Posi-Lock	$ 347.27
200709 1.75x-5x Safari Post Crosshair Matte	$ 356.84
200603 3x-9x Ballistic Plex Matte	$ 342.49
200817 6x-24x Plex Black	$ 404.67
200816 6x-24x Ballistic MDot Matte	$ 507.04
200850 8x-32x Fine Plex Black	$ 435.29
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200866 8x-32x Fine Plex Nickel	$ 450.59
200861 8x-32x Ballistic Mil-Dot Matte	$ 516.61

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200057 6x-32mm HBR II SuperFine Xhr Matte	$ 275.52
200056 6x-32mm HBR II .375 Dot Matte	$ 287.96
200160 3x-9x-40mm Plex Black	$ 179.84
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200162 3x-9x-40mm Ballistic Plex	$ 189.42
200163 3x-9x-40mm Plex NIC	$ 198.99
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200153 3x-9x-50mm Plex Matte	$ 257.34
200154 3x-9x-50mm Ballistic Plex Matte	$ 262.13
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49026 6.5-20x50mm AO Matte Leupold Dot	$ 545.47
52198 6.5-20x50mm AO Matte Mil-Dot	$ 584.62
51605 6.5-20x50mm LR Target Matte Fine Duplex	$ 633.34
51621 6.5-20x50mm LR Target Matte Target Dot	$ 669.44
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52078 6.5-20x50mm LR Target Silver Fine Duplex	$ 633.34
52080 6.5-20x50mm LR Target Silver Target Dot	$ 669.44
51606 8.5-25x50mm LR Target Matte Fine Duplex	$ 691.19
51622 8.5-25x50mm LR Target Matte Target Dot	$ 717.29

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53906 1-4x20mm Matte Duplex	$ 237.77
53931 2-7x33mm Matte Duplex	$ 255.33
53941 2-7x33mm Matte Leupold Dot	$ 281.43
54182 3-9x40mm Gloss Duplex	$ 257.94
54194 3-9x40mm Gloss Heavy Duplex	$ 257.94
53956 3-9x40mm Matte Duplex	$ 257.94
53966 3-9x40mm Matte Leupold Dot	$ 284.04
53986 3-9x40mm Silver Duplex	$ 257.94
54201 3-9x50mm Gloss Duplex	$ 307.53
54215 3-9x50mm Gloss Heavy Duplex	$ 307.53
53991 3-9x50mm Matte Duplex	$ 307.53
54011 3-9x50mm Matte Heavy Duplex	$ 307.53
54001 3-9x50mm Matte Leupold Dot	$ 333.99
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54071 4-12x40mm AO Matte German #4	$ 381.84
54081 4-12x40mm AO Silver Duplex	$ 353.13
54086 6-18x40mm AO Matte Duplex	$ 377.06
54091 6-18x40mm AO Matte Leupold Dot	$ 398.88
54096 6-18x40mm AO Target Matte Duplex	$ 398.88
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49801 6.5-20x40mm EFR Target Matte Fine Duplex	$ 512.95
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53432 35x-45mm MATTE 1/8 MIN DOT	899.95; CASH 879.95
53434 40x-45mm MATTE TARGET CH	899.95; CASH 879.95
53436 40x-45mm MATTE 1/8 MIN DOT	899.95; CASH 879.95
53438 45x-45mm MATTE TARGET CH	899.95; CASH 879.95
53440 45x-45mm MATTE 1/8 MIN DOT	899.95; CASH 879.95
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52218 3.5-10x40mm LR M1 Matte Duplex	$ 636.99
52128 3.5-10x40mm LR M1 Matte Mil Dot	$ 704.24
53666 3.5-10x40mm LR M1 Illuminated Matte Duplex	$ 804.29
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51182 3.5-10x40mm LR M3 Matte Duplex	$ 636.99
51850 3.5-10x40mm LR M3 Matte Mil Dot	$ 704.24
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51604 4.5-14x50mm LR Tactical Matte Fine Duplex	$ 598.71
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54560 4.5-14x50mm LR M1 Matte Mil Dot NEW	$ 727.05
54680 6.5-20x50mm LR M1 Matte Mil Dot NEW	$ 774.57
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45580 Mark 4 M1-16x40mm Matte Duplex	$ 985.86
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(BENCHREST MODEL)	
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8-32x56mm	$1047.80

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800474 3.5-10x50 Black Matte	$ 303.34
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800469 6.20x40 W/AO DPLV Black Matte	$ 336.31
800476 6.20x40 W/AO Dot Black Matte	$ 336.31
800588 3-10x40 A/O SILVER	$ 250.45
800589 3.5-10x50 SILVER	$ 303.34
800590 4.5-14x40 SILVER	$ 328.51
800591 6-20x40 A/O SILVER	$ 336.31
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849970 Target T-36x40 FCH Blue	$ 389.95
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849445 3-9x40 Tactical Scope	$ 436.84
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849405 V-10 2-10x38 Matte W/FMC	$ 159.58
849406 V-10 2-10x38 Silver W/FMC	$ 159.58
849407 V-10 2-10x50 Matte W/FMC	$ 224.84
849403 V-9 3-9x50 Matte W/FMC	$ 195.12
849408 V-16MDX 4-16x42 Matte W/FMC	$ 266.77
849409 V-16MFC 4-16x42 Matte W/FMC	$ 266.77
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849417 KT15 15x40 Gloss	$ 229.49

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849431 2.5-7X28 MATTE	$ 121.14
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CLASSIC HANDGUN

849427 1.5-4X20 GLOSS	$ 175.90
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MY F-Class PROJECT RIFLE (or, how I did it myself)

PART 1

BY STAN LAWRYNOVICZ

Since participating in my first Palma match two years ago, I've been hearing shooters talk more and more about a type of long-range target competition called F-Class, which apparently was started to keep the older shooters in the long range target game. Last year I did try my hand at an F-Class match, and found out that my current rifles and scopes were not up to the task since I did not want to put a scope on my Palma rifle. I thought to myself, if I really wanted to compete in this type of match—what would I shoot?

Years ago, I acquired my father's old U.S. Model of 1917 Winchester that had been sporterized by a friend of his who did a very nice job on the barreled action, but the wood stock left much to be desired. And while it was still chambered in the original 30-06 Springfield, the bore was quite dark. It looked—and shot, poorly.

Now, I had heard from several other shooters that this model rifle had a reputation for excellent accuracy (**PS** article, page 31, September, 1999). I felt that since I already had this rifle with what appeared to be an excellent action, perhaps I could use it as the basis for an F-Class project gun. I knew this would certainly please my wife since I would be recycling an existing rifle, and not acquiring another one!

Let me say at this point, that I am not a gunsmith. And like many of those involved in the shooting sports, I would love to have been one. My only experience in this area has been confined to refinishing a number of military gunstocks and sporterizing an old Mauser 98 with my father 30 years ago. What I was now contemplating with this F-Class rifle was obviously much more ambitious than anything that I had ever taken on before. But, I believed it could be a great learning experience as well as a rewarding one.

Coming up with a plan…

Since I already had an action; that only left me to obtain:

A). A new target barrel chambered in a caliber suitable for long-range work.

B). A new target stock already inletted for my old action.

C). A new telescopic sight with optics and adjustments appropriate for shooting at long distances.

I thought to myself more than once, that it probably would be a lot simpler to just find a reputable gunsmith and let him have at it. Simpler, yes. As rewarding, no. Since I am a great one for tinkering and doing things myself, I decided to push on. I would do my homework, and perform as much of the work myself as I could. While I wanted to make this an interesting and fun project, I also wanted to try to keep the costs down wherever possible.

What caliber to use?

It seems that everyone today has their own opinion of what super-magical magnum wildcat round is best-suited for long-range work. So, I took stock of a few things:

A). I would prefer not to end up with a detached retina from firing magnum rounds repeatedly (I actually have a family history of this problem).

B). Since I'm a pretty skinny guy, my shoulder already takes enough pounding shooting a .308 in my Palma gun in the prone position.

C). I already have too many calibers that I reload for. I really do not need another one.

So, I decided not to go with a 30-338 or a 6mm-284 or whatever. I would stay with the original 30-06 Springfield chambering (Horror of horrors! Heresy!). Hey folks, it's my gun. Besides, the 30-06 has been around for a heck of a long time, and it would be fun to see how accurately I might be able to shoot it at really long range from an action that was originally designed for it.

My biggest concern was that this cartridge might not move a big heavy bullet (say 190 or 200 grs.), fast enough to stay supersonic at long distances. After doing some initial homework, most people seemed to agree that up to a point, you can get anywhere from 15-50 fps additional velocity for each additional inch you add on to your total barrel length. So, if I load a 190 gr. bullet that gets 2600 fps out of a 26 inch barrel, I'm hoping that if I use a 32 inch tube on my project rifle, I will end up with between 2700-2800 fps at the muzzle. I know I need to remain above the speed of sound until the bullet strikes the target (approx.1100 fps). So, what was needed at this point, was to work with one of the

Continued on next page

My F-Class Project Rifle (or, how I did it myself) Part 1

Continued

currently available ballistics programs, and verify what muzzle velocity was required to remain supersonic out to 1200 yards. What I found out was that with the Serria 190 gr. HPBT Matchking bullet with a B.C. of .533, the magic muzzle velocity was 2700 fps. This velocity will keep the 190 gr. bullet supersonic out to 1200 yards, which was my goal since there is a range in Lodi, Wisconsin (not too far from where I live) that currently has matches out to this distance.

When I was reviewing my project with one of my shooting buddies, he said "If you're going to order a long, heavy barrel, why don't you use a barrel block? And I replied, "A what?" Apparently, everyone in the shooting community but me has known about this method of clamping the barrel just forward of the receiver, and then bedding this barrel block to the stock—instead of bedding the receiver to the stock. In this way, the long heavy barrel will not stress the action as it would if the receiver was bedded in the normal fashion. I wasn't very successful in locating much detailed information on this system of using a barrel block or even a decent design for one—even though it has been used for years in benchrest circles. The closest I came was an article I saw by chance in *The Accurate Rifle* (**AR** article, page 28, February, 2002) and one in *Precision Shooting* (**PS**, page 7, May 2000). So, I started to draw up my own sketches with some help from two other fellow engineers at work, Micah and Jerry, and eventually came up with what I felt was a workable design **(see CAD print).** In the photos of barrel blocks I've seen, they are apparently made from square or rectangular stock. In the end, I decided to go with round stock which I felt would be more pleasing to the eye. From the very start of this project, it was very important to me that the rifle perform well in terms of accuracy, but I also wanted it to look great!

What barrel to use?

Since I currently live in Wisconsin, I decided to either go with an Obermeyer or Krieger barrel. (Both companies are located in this state.) In the end, I went with Krieger because I liked the idea of how they use cut rifling in their barrels (**PS** October, 1997, page 32). After visiting their website, I called Krieger and reviewed with them what I wanted to do. They were very helpful, and I eventually drove over to their facility with my old barreled action. Once there, I filled out all the appropriate items on their company work order that I wanted performed, which included the following:

A). A stainless steel barrel, 32" long, chambered in 30-06.

B). The barrel profile would be their #17 heavy varmint that would have a diameter of 1.250" at the receiver face. That diameter would continue out to 7" beyond the face of the receiver (in order to accommodate my 7" barrel block length), and would then taper down to .90" at the muzzle.

C). The rifling would be a 1 in 10" twist since I would be shooting heavy bullets of at least 190 grains.

D). Give it a double cryogenic treatment.

E). Check the receiver and bolt face to make certain they are square, and true-up if necessary.

The Target Scope

I felt that if I was going to spend good money on a scope (my single largest purchase for this project), that I should certainly do my homework first. I eventually looked through every scope I could lay my hands on. Then my good friend Larry Rivard (who has written for **PS** in the past) said that I should have a look at

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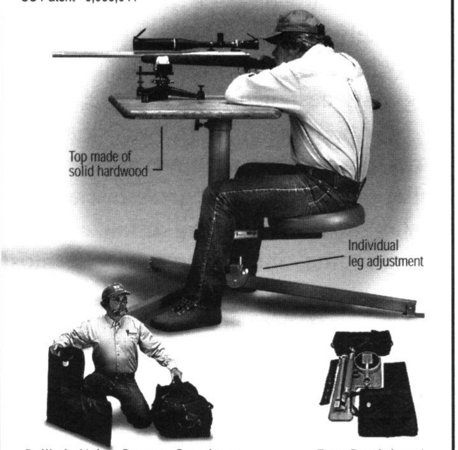

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the **PS** January, 2001 issue, because there was a really interesting article on IOR scopes, which is a firm that I had never even heard of. After reading the article, I knew I just had to somehow find a way to look through one. Well as luck would have it, while on vacation last summer in Texas I went to a gun show in Houston (it is a requirement that I attend as many gun shows as possible when I am on vacation), and I actually encountered a vendor that had some of these scopes on display. And just like the **PS** article, I felt that the construction and optics of this instrument were extraordinary! I just had to get me one of these! Three months later I became the proud owner of a 4—14 x 50mm IOR—Valdada tactical scope with a 30mm tube and illuminated MP-8 reticle (just in case I have to shoot a match at dusk!).

Making the Barrel Block (the planning)

After obtaining a piece of oversized 6061 aluminum round-stock that was 4" in diameter and 16" long (I felt that steel would have made the rifle much too heavy), I made a fixture that would keep the piece square while I cut it in half, along its length, on a band saw. My intent was to fabricate a barrel block that would also incorporate a scope rail support. The reason why I decided not to mount the scope on the receiver was that I did not want to drill and tap the front receiver ring & ruin the look of the "U.S. Model of 1917 Winchester" scrolled into the top of the receiver ***(see photo of the receiver front ring—receivertop1).***

Since I wanted to make a barrel block with 7" of bearing surface for the barrel support, my receiver/bolt clearance would

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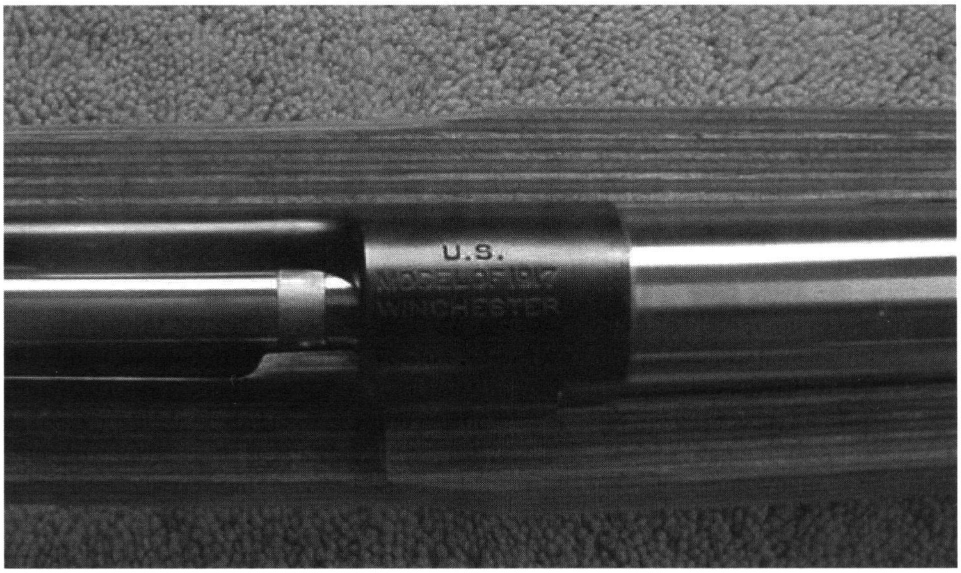
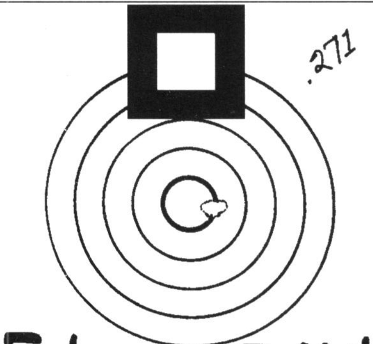


Receivertop 1.



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My F-Class Project Rifle (or, how I did it myself) Part 1

Continued

allow for a scope rail base 6 1/2" long, and would provide sufficient support for my scope. So, I would require a finished overall length of 13 1/2" for the top half of the barrel block assembly.

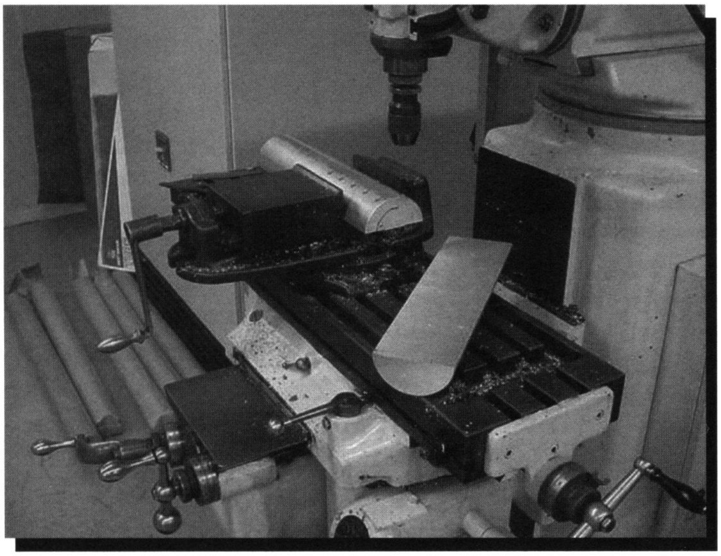
The front receiver ring diameter on my action measures 1.320" vs. 1.250" for the new barrel. I would eventually bore the barrel section of the barrel block .001" undersize (.0005" each side), and then bore the section that would overhang the receiver at 1.40" in order to allow for adequate clearance between the two.

Time to Start Cutting Metal

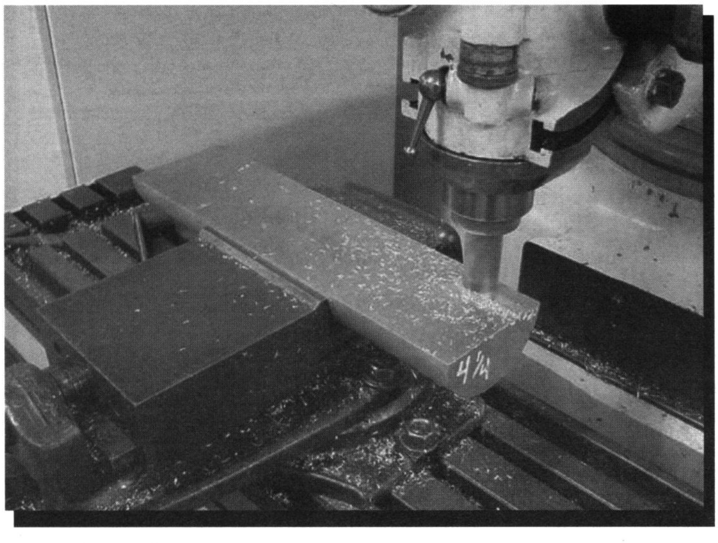
Once the original piece of round stock was cut to length, both halves then had a finished flat milled along the sawed surfaces. Next, a male key was milled onto one flat surface, and a matching female key was milled into the other. The completed key would be just wide enough so that when the final bore was cut for the barrel, 1/16" of the male section would still be left on each side of the bore to fit with the female section. This would ensure a parallel fit that would allow for precise alignment of the 5 pairs of 10 x 32 socket head cap screws whenever the two sections would need to be re-assembled ***(see photos—barrelblock1,2,3,4,5).***

In order to give the barrel block a clean and finished look, I opted to bolt the two halves together from the bottom section, and then drill & tap blind holes into the top piece. After the 10 clamping holes were drilled on the barrel end of the assembly, I drilled two more at the opposite end. This was to make sure that both ends of the rough barrel block assembly would be tightly secured during the process of turning the piece down in a lathe to the finished inside and outside diameters. ***(see photos—barrelblock6,7).***

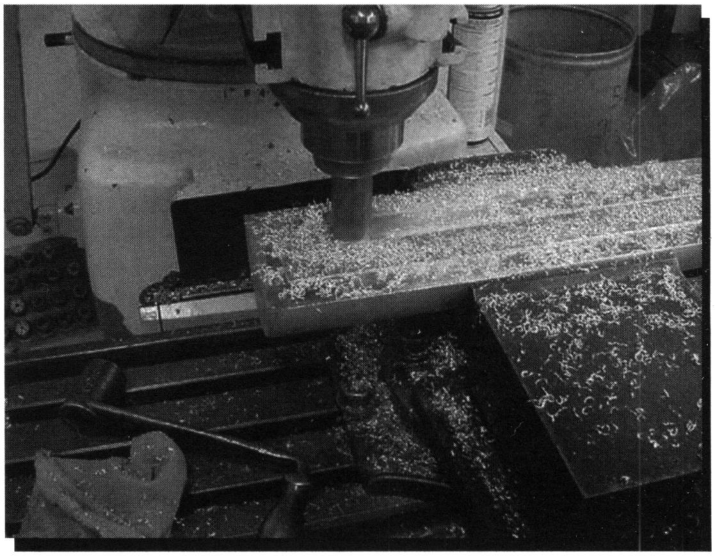
The first step of boring the hole for the barrel was to find the center of the assembly, and then drill a center hole. Once this was done, successively larger and larger drill bits were used to bring the bore up to 1.125". ***(see photo—barrelblock8).*** The top section of the barrel block which would go over the receiver was drilled out to 1.40" and would allow for 0.10" clearance. Final bore size for the barrel section would be 1.249". In order to



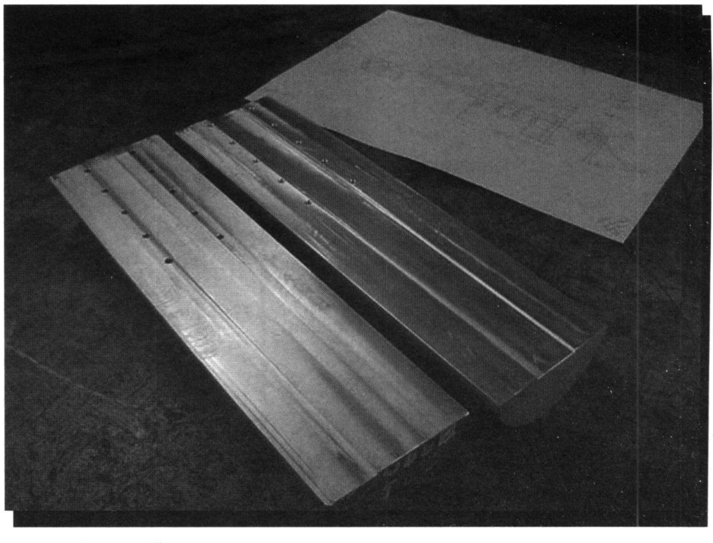
Barrelblock #1



Barrelblock #2



Barrelblock #3



Barrelblock #4

perform this step, a boring bar was used on the lathe. Once the final diameter was achieved, the boring bar was run in and out twice in order to ensure a precise fit and full contact of the barrel block with the barrel. ***(see photo—barrelblock9).*** After removing the assembly from the

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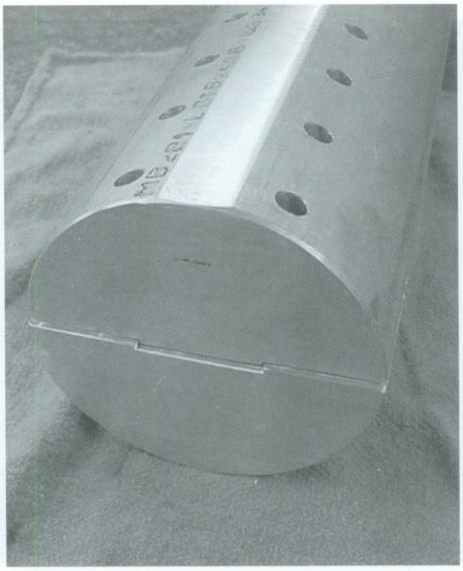

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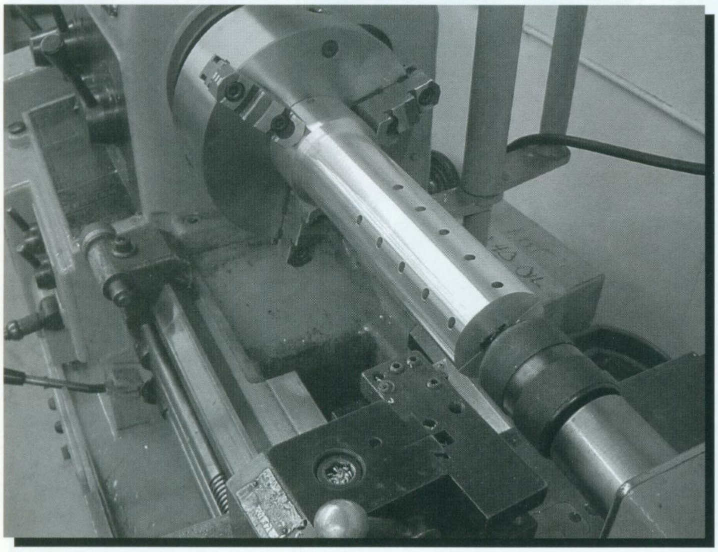
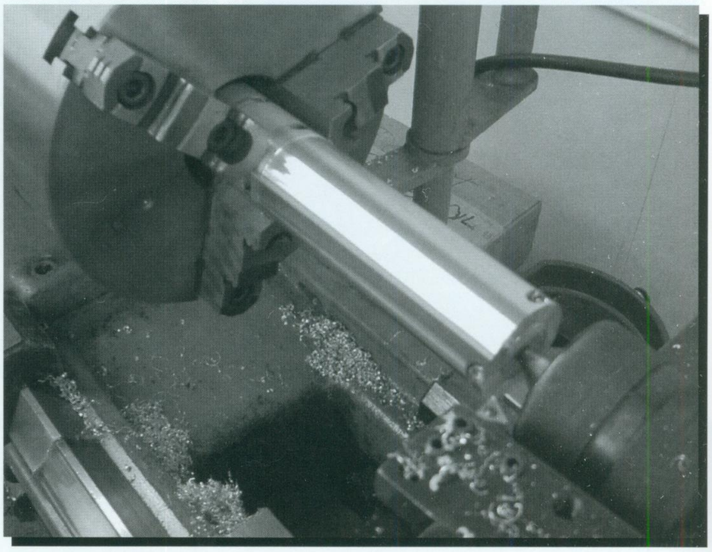
lathe chuck, all of the retaining screws were removed, and the two halves carefully pulled apart. As you might expect, all of the machined edges were very sharp. These edges were then carefully removed using a fine grit silicon carbide paper and a light oil (WD-40 actually).

Next, the bottom half was secured in a vise, and a 5/8" wide flat milled onto the bottom outside surface. Holes were drilled and tapped for three 5/16" x 24 (fine thread) bolts. These bolts would eventually be used in conjunction with aluminum pillars and a base plate, to secure the whole assembly to the stock.

The top half of the barrel block was then put into the vise on the milling machine, and a 7/8" wide flat was cut along the top of the outside surface located on the end that would be positioned over the receiver. This flat would provide the mounting surface



Barrelblock #6



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for the scope base ***(see photo barrelblock10).*** Seven holes were then drilled and tapped for the 8 x 32 socket cap head screws that will hold the scope base to the top half of the barrel block.

Next, the bottom half of the barrel block had 6 1/2" milled off of its rear (receiver end). The top half had a notch cut into the end of the left side to conform to the shape of, and allow for, access to the bolt release catch. The right side was then milled out for easy access for loading and case ejection.

Both halves were cleaned and then checked for fit with the barreled action. Saints be praised! A perfect fit! ***(see photos of the two barrel block halves. Files barrelblock11,12,13).***

Aluminum Base Plate

The base plate is the key part that will ensure that the whole barrel block assembly will be properly secured within the stock. I obtained a piece of 3/8" aluminum flat stock and cut it down to a rectangular piece measuring 1 3/4" x 6". Clearance holes were drilled into the plate that conformed to the spacing of the three mounting holes located in the bottom half of the barrel block.

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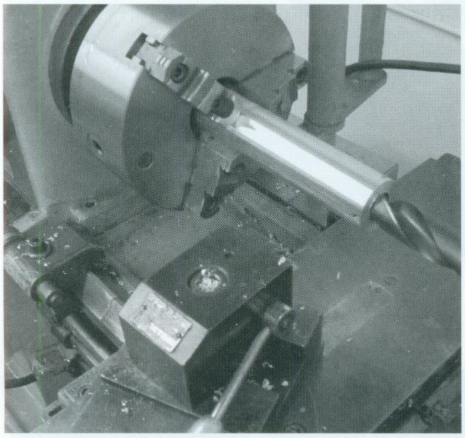
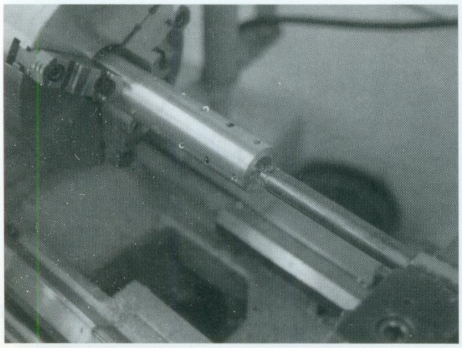


Barrelblock #8



Barrelblock #9

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The Aluminum Pillars

An 8" section of 1" diameter aluminum round stock was cut down to .70" in diameter in the lathe. This diameter would allow enough clearance for the glass bedding compound and the inside surface of the .75" diameter holes that would be drilled into the stock. Once the base plate was inletted into the bottom of the stock forearm, the correct length for all three aluminum pillars would be determined. Three sections of the round stock were cut to length on the lathe after having three parallel 1/8" wide grooves cut into their surfaces. Having never performed pillar bedding before, I believed that these grooves would provide the glass bedding a better grip on each pillar. Hey, maybe the grooves won't make any difference in the long run, but the idea still sounded good to me. Also, since my base plate did not turn out to be perfectly flat, I had to fit each pillar—polishing them by hand on a glass plate. Making sure that when the whole assembly was put together using moderate pressure on each of the three screws, each pillar showed the same resistance when turned using two fingers. I marked them for position, and then identified the orientation of the base plate as well—a true custom fit. ***(see photos of barrelblock16).***

Inclined Scope Rail

Seeing that I would be shooting out to at least 1000 yards, and possibly as far as 1200, I wanted to give my telescopic sight as much help as I could. Other shooters have suggested to me that I should purchase a base that had 20 minutes of elevation already built-in, and not depend upon having to use the full range of my scope elevation (it has 88 minutes). Since I did not feel like spending additional money on a special base (I've already spent a lot on this project), I decided to make my own (well, almost). I purchased a 10" steel Weaver-style scope rail from Brownells with a flat base. The total height of this rail was 5/8". I felt this height would give me plenty of metal to work with when I went to mill 20 minutes of angle off of it. OK, most shooters know that one minute of angle at 100 yards is equal to approximately one inch. So what

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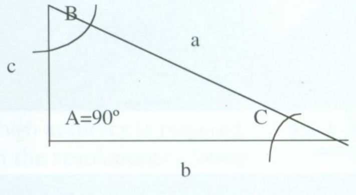
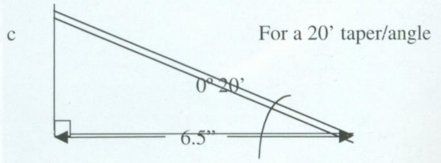
Inclined Scope Rail Math

Using Trigonometry for right triangles





c = b x Tan c
c = 1 x Tan 20'
c = 1 x 0.00582
0.00582" = taper/inch

If b = 6.5"
6.5 x 0.00582 = 0.03783"

in the world does that mean in terms of machining a scope base with 20 minutes of angle (elevation) built-in?

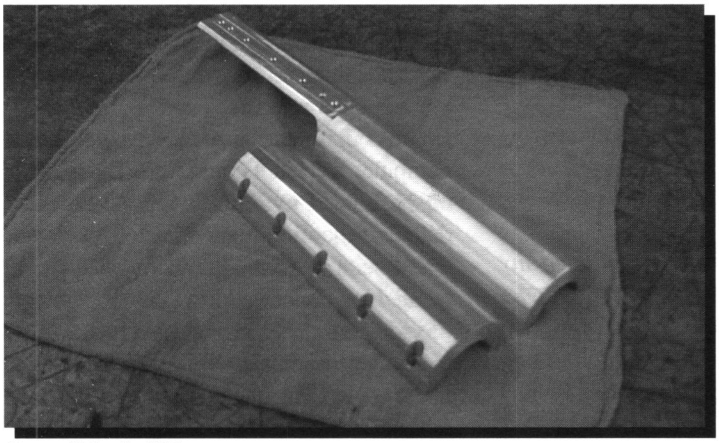
I went back to my trigonometry books for the appropriate calculations **(see file SCOPERAIL2.doc with trig. diagrams, equations)**. The end result of my homework was that 20 minutes (a third of a degree) is equal to a taper of 0.00582"/inch. Since my finished rail length was 6 1/2" long, then 6.5 x 0.00582 = 0.03783".

So, when setting up the piece in the milling machine, we used a dial indicator to read 0.0" at one end of the bottom of the rail, and 0.0378" at the other. After double-checking our measurements, we then proceeded to mill the excess off.

The remaining 3 1/2" of scope rail left over from the original 10" piece would first be cut into two smaller sections. Then, like the main scope rail, they would be drilled and countersunk for mounting screws, and cross slots would be cut for the scope ring tension screws. These two mounts would only be used for breaking-in the barrel, and eventual load development at 200 yards.

SUMMARY

What we've just covered in Part I, has been a review of the concept, final design, and the eventual metal work for my long-range rifle project. In Part II, we will get into the stock work and load development, and then see whether or not my great experiment will actually shoot!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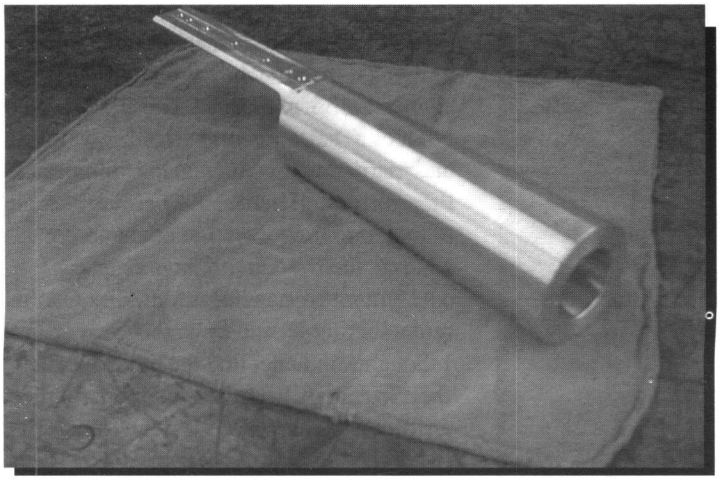
Barrelblock #13

Bibliography:

Krieger Barrels Inc.
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www.kriegerbarrel.com

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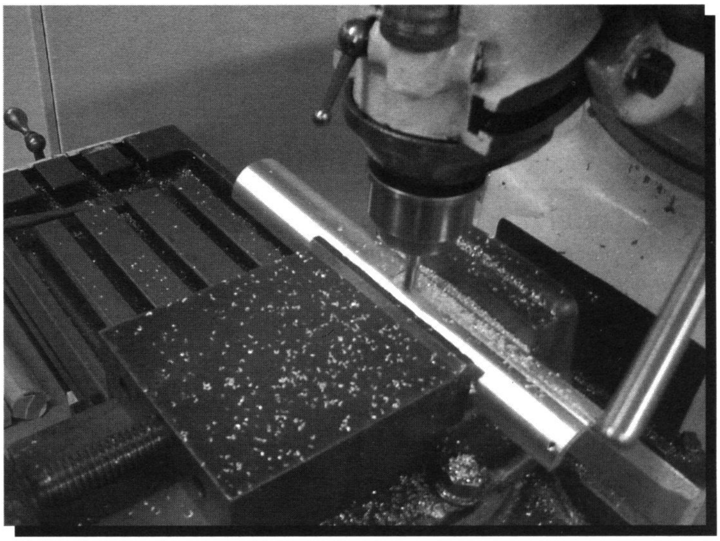
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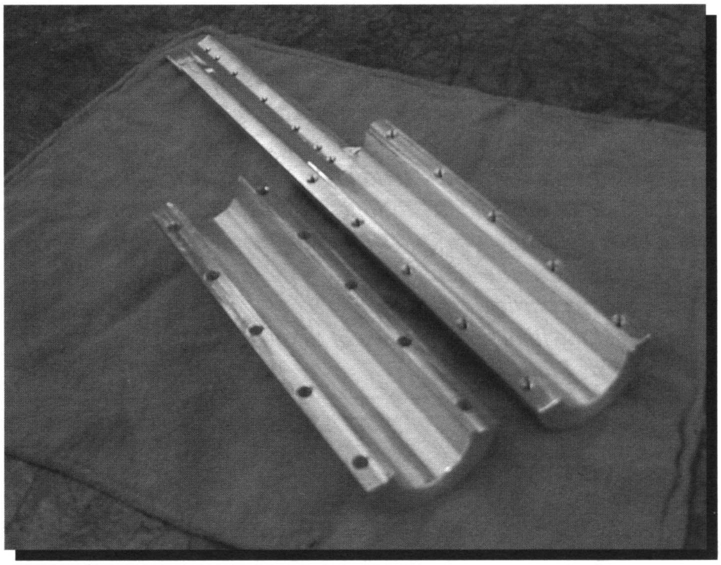
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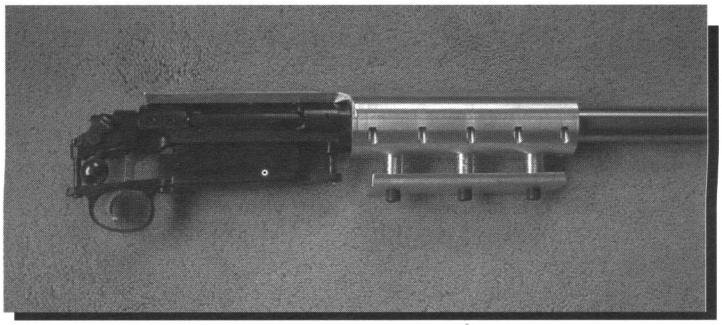
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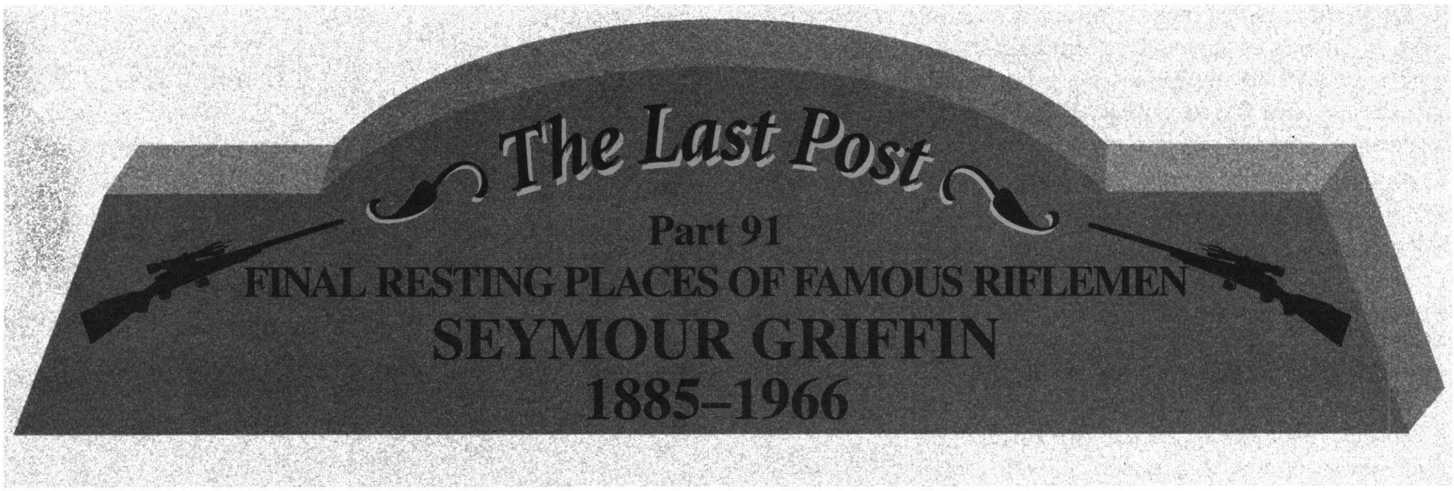


The Last Post

Part 91

FINAL RESTING PLACES OF FAMOUS RIFLEMEN

SEYMOUR GRIFFIN

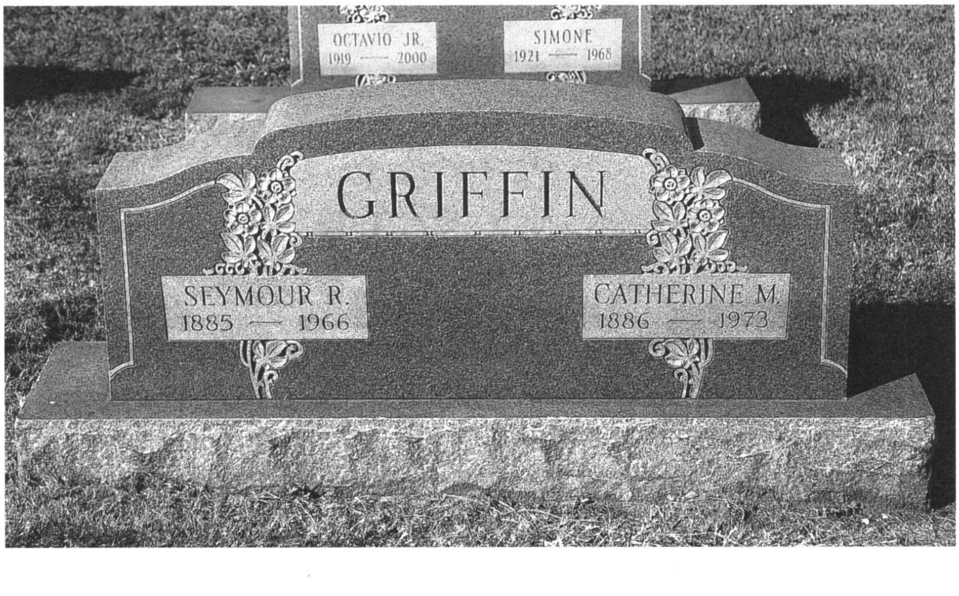
1885–1966

BY MACK IRELAND

This "Last Post" will be an unusual one, since we will focus on the search for the final resting place of Seymour Griffin, one of the two co-founders of Griffin & Howe, a company that was in the forefront of fine custom gunsmiths for many long years after their June 1, 1923 founding.

By way of background to what the Editor considers a most unusual and interesting tale, we offer the following…. Yours truly recently retained the services of a genealogist to trace the history of his paternal great grandfather…a gentleman who left County Clare rather suddenly back in 1867, hidden in a barrel aboard a sailing ship bound for America. The rather unusual accommodations were apparently brought about by a trifling difference of opinion shortly before, involving a certain number of English constabulary and a roughly similar size group of Fenians, one of which was great grand pop. When the gunsmoke had settled, and most of the bleeding had been stopped, my grandfather found himself with a burning desire to see the land of opportunity that he had heard so much about, and the sooner the better. His sudden, even unseemly, departure was (I am told) much regretted by the English (who were probably a bit put out by their inability to say good bye to him; the Irish have long been less impressed with the need for all the social niceties at such times).

In the course of a conversation with the genealogist (a nice lady, with the very promising name of Mack Ireland) I wandered off the subject a bit and mentioned my frustration at my inability to find the gravesites of two gentlemen from Connecticut who had been well known in firearms circles, Seymour Griffin and Christian Sharps. To make a long story short, she found both gravesites in short order (and I had been looking for them both, Sharps particularly, for years). At my request she wrote a brief summary of just how she found the final resting place of Seymour Griffin…and I hope that you enjoy reading it as much as I did.



The Search for Seymour Griffin

Seymour Griffin entered this world on October 19th, 1885. He was a healthy baby and the son his father, Arthur and his second wife Helen (Hubbard) were hoping for. Brother Allen, always to be called Allie arrived a few minutes later. In the days before sonogram and ultrasound, Allie was a surprise package.

There are good stories in the Hartford, CT area about Seymour Griffin. People thought well of him and he is remembered with respect. My problem began when I realized that no one seemed to know where he is buried.

To begin the search I used every computer website I could find. The Church of the Later Day Saints supplied his birth date and the month and year of his death. The Social Security Death Index told me he died in Bradenton, FL. I began scanning Florida cemeteries on-line. No luck.

I spent a day at the Hartford Public Library going through microfilmed Obituaries from *The Hartford Courant* hoping for information. No luck. I went to the Connecticut Historical Society and found information about his professional life but no real personal information.

I knew he had a business in New York and lived for a while in Great Bear; I checked all of the cemeteries in that area. No luck. Then I remembered that he loved and married two women in his lifetime and they were both named Katherine. I began to look into their lives and could not locate a burial site for either one.

I turned my attention on Allie Griffin remembering he and Seymour were twins. I thought, find one, find the other. I went to the Genealogy websites and found Allen Griffin very easily. He was an attorney and lived all of his life in Connecticut. He is buried in Copper Hill Cemetery near the family home in East Granby, his brother is not.

I placed messages on the genealogy message boards. Within a week I heard from a gentleman who told me that members of the Griffin Family are still living in Connecticut. Within an hour I was speaking with Phyllis Griffin, daughter of Allie Griffin. She still resides on the Griffin homestead where both her father and Grandfather were born. She always refers to Seymour as "Uncle Seamer" in her wonderful New England accent. She told me her Father and his twin brother didn't always get along and often didn't stay in touch. She was delightful to talk to, but she didn't know where her Uncle Seamer was buried. She referred me to Fred Griffin, her cousin.

Fred is also of the same sturdy New England stock and a wonderful conversationalist. He told me Seymour was married twice and retired to Florida, but didn't know where he was buried. He referred me to Junior Phelps.

In Murray "Junior" Phelps I found a font of information. His Mother, 93 years old and still living in Florida had attended the funeral services for Seymour Griffin. He would call her the next morning and ask about the services and burial location. Would I call him again the next night? Would I?

Junior Phelps told me Seymour Griffin actually lived with his family for a while after a falling out with his father. He still has a gun cabinet in his home handcrafted by Griffin. For a while they were sure Seymour would make his fortune as a cabinet maker. Mr. Phelps remembered that even after his retirement Griffin still could produce beautiful work in the room in his garage. He spent hours cleaning and polishing a stock until the wood glowed with warmth and became satiny to the touch.

He and I spoke the next morning and his Mother did indeed remember the services for Seymour Griffin. They were held at the Griffith Funeral Home in Bradenton, FL. She could not recall the name of the cemetery. I was more than happy with what she remembered.

I wrote an email to the Griffith Funeral Home. Ten minutes later becoming too impatient to await their reply, I picked up the telephone.

As the telephone rang I thought, "This is it, I've found him at last." There was a snag-of course. The year 1966 is not in the computer system. The secretary told me there would be a delay of about an hour while she checked in the file room for the folder. True to her word she returned my call within the hour. He is buried in Manasota Gardens, Bradenton, FL. She was able to connect my call to the cemetery offices for the plot and grave number. I am in her debt.

I am impressed by people who have a minute for everyone. A neighbor stopping Seymour Griffin on the street to discuss duck hunting got the same undivided attention as Prince Phillip of England calling to discuss gun specifications. The Shah of Iran was especially pleased with his custom made rifles. I think his statement says it all, "Forever there will be two sets of fingerprints on this gun, mine and those of Seymour Griffin."

Mack Ireland

In the January 2003 Editorial in **PS** *we invited any of our readers who were in the Tampa vicinity to get us a photo of the gravestone, and mentioning that we would pay our usual $100.00 stipend to the individual submitting the best photo. Once again proving that it never rains but it pours, three of our readers…Dave Smith, Gene Pitts, and Ranay Yonkers…had perfectly satisfactory photos in here before the ink had completely dried on their January issues. We were unable to pick a "best photo" among the three…so we have increased this month's photo fee, and paid the three of them equally. Thank you for your efforts in our behalf, gentlemen.*

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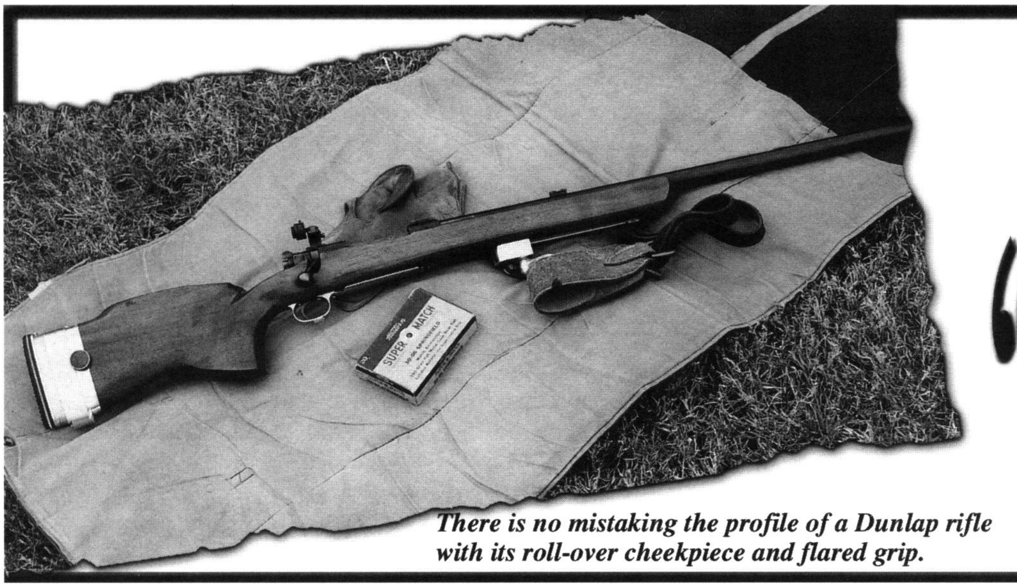
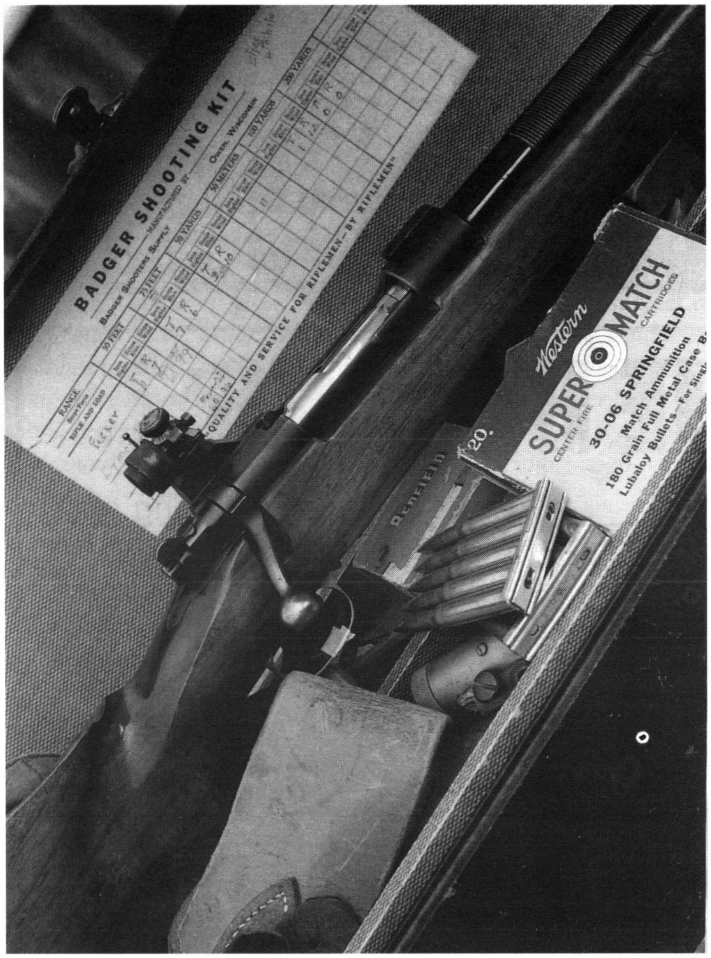
A Rifle NAMED "ROY"



There is no mistaking the profile of a Dunlap rifle with its roll-over cheekpiece and flared grip.

BY J.W. GAINES

Every now and then I meet a firearm with character gained through a long life of hard use. It is as if they had a life of their own, and I say to myself "Gee, I wish it could talk!" Such a firearm is a rifle named "Roy".



A rifle named "Roy" came with Roy Dunlap's shooting box, his sling and mitt, and accessories. It is the prize possession of Richard King of Arlington, Texas who was a personal friend of Dunlap.

Roy is a pre-war Model 70 Winchester target rifle. Master gunsmith Roy F. Dunlap built it. What makes it so special is that it isn't just *a* Dunlap rifle, it is *Dunlap's* rifle!

I first saw the rifle at the Texas State Rifle Association long-range championship in October of 2000. I recognized it as a Dunlap rifle from a distance as it rested upon the shooting stool of a competitor. There is no mistaking a Dunlap stock with its exaggerated pistol grip and high comb cheekpiece. I wandered over to take a look and meet the owner, Richard King.

I asked permission to look at the rifle and when I picked it up I was surprised by the details. Not only was it a pre-war Model 70, but it had a Vaver rear sight, and the front sight that I at first thought was a Tompkins sight, was actually a Redfield International with a spirit level attached to the side with a bracket. Even more surprising was the barrel. It was grooved radially. Actually, it was threaded! That was when Richard told me it was Roy Dunlap's own rifle.

The story of how Richard got the rifle is interesting. He started his shooting career in 1966 while serving in the Army at Fort Bliss, Texas. He shot an M14 for the Fort Bliss rifle team and traveled a circuit of matches in Capitan, NM, Oklahoma City, OK, and Camp Bullis, TX. In those days a soldier had to "shoot" his way on to the fort team, then onto the Army team. If he stayed with the program and developed his skills he progressed to the bolt gun team. If he really had the right stuff he made the long-range bolt gun team.

Richard never made it beyond the fort team, but he always admired the bolt gun shooters and their rifles. They shot Model 70 rifles in 30-06, and the best of the best shot Dunlap rifles. Civilian shooters who were really serious also shot Dunlap rifles. The Tubb family gladly challenged the Army teams at every opportunity with their Dunlaps. To Richard, watching these shooters fire a rapid-fire string was like watching "poetry in motion!"

After he got out of the Army, Richard shot silhouettes for a time, then returned to shooting across the course. After shooting an M1 and an M1A, he tried shooting a remodeled Springfield '03-A3 bolt gun. Eventually he decided to fulfill a dream and acquire a Dunlap-built Model 70.

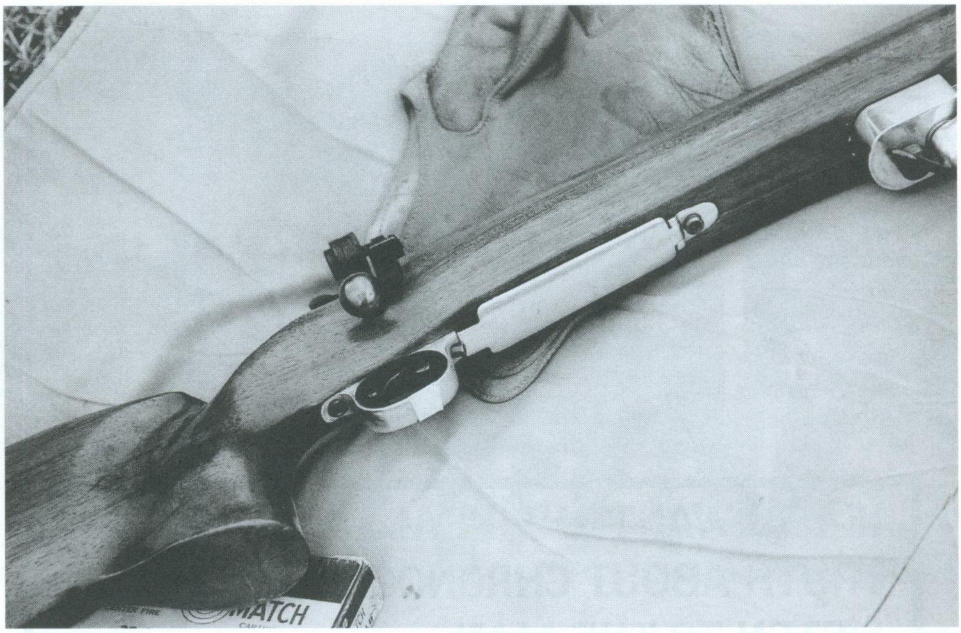
Responding to an ad in *Shooting Sports USA* he called Jim Holden, a noted high power shooter. He inquired if he knew of any Dunlap across-the-course rifles for sale. "Why don't you call Roy Dunlap himself. Maybe he knows of one," said Jim, and he gave Richard the phone number.

When Richard made the call he was surprised when Roy offered, "The only one I know of is the one that I used. You wouldn't want that, would you?" Richard politely asked the selling price, but in his heart he knew it did not matter. He was going to own that rifle! Roy sent him a letter with the details of the rifle and a deal was made. Roy delivered the rifle to Richard at the NRA Convention in San Antonio that year.

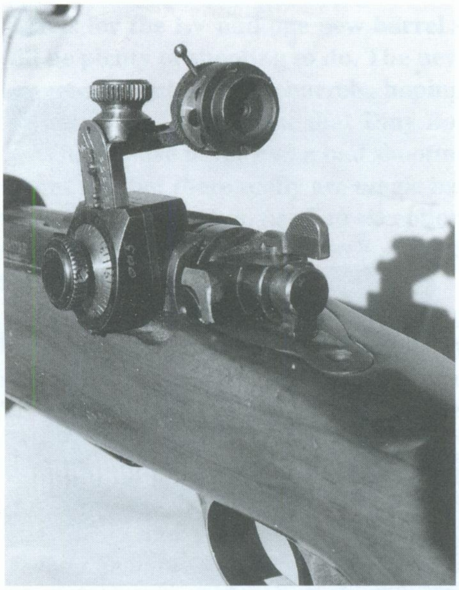
Included with the rifle were Roy's sling, mitt, shooting box and some accessories. Also included were some unopened cans of Dupont 4350 powder in the original cardboard containers, some Hornady 190 gr. rebated boat-tail bullets, and some 1964 Lake City match brass.

Richard is an accomplished gunsmith and he and Roy soon became friends. Over the next few years the two visited each other several times. Richard quizzed Roy for details about accuracy work and

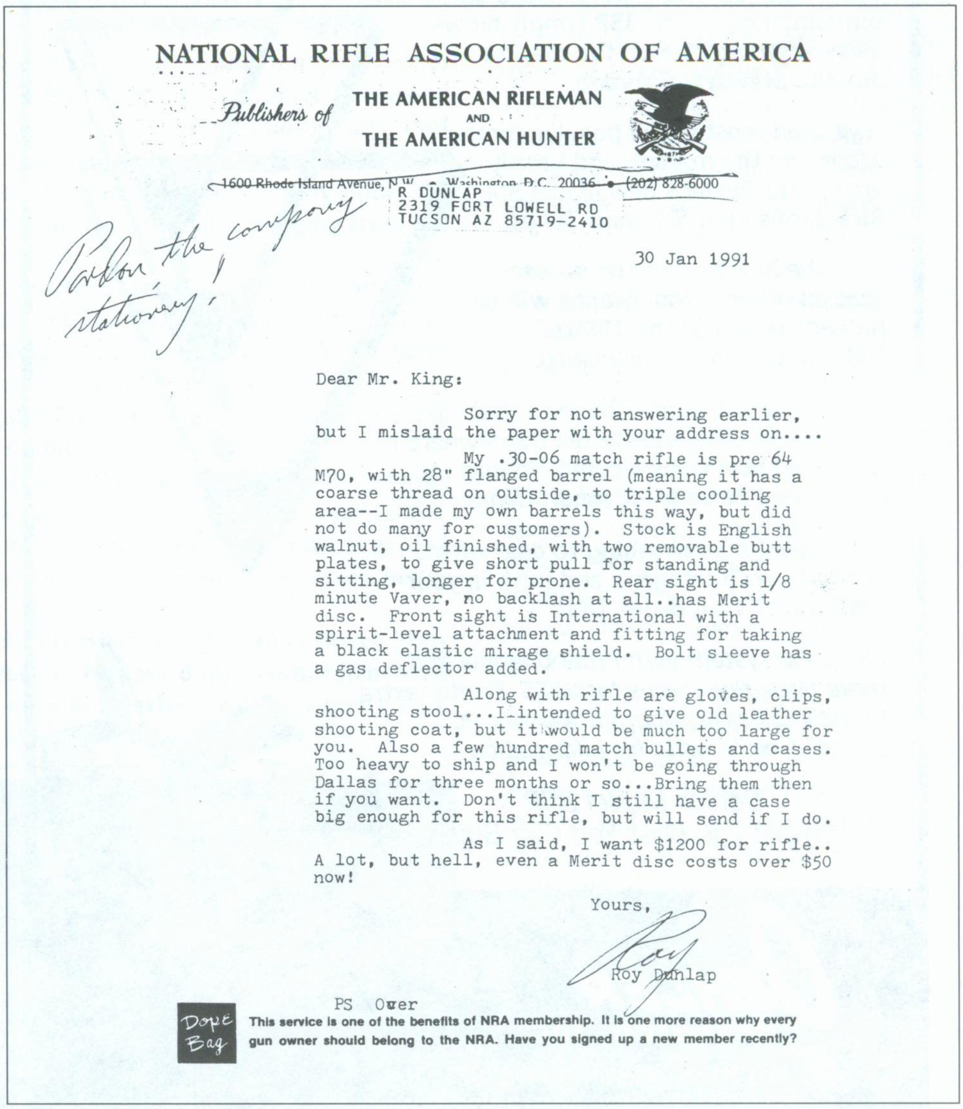
Continued on next page



The pre-war Model 70 has a polished featherweight floor plate and trigger guard. Note also the socket head cap screws for guard screws. Were these tightened with the homemade wrench?



Vaver Corporation, Chicago, Ill. made the rear sight. The aperture is an iris controlled by the lever on top. Various color filters are on a disk that can just be seen on the left of the iris assembly. Note also the gas shield that covers the bolt release.



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30 Jan 1991

Dear Mr. King:

Sorry for not answering earlier, but I mislaid the paper with your address on....

My .30-06 match rifle is pre 64 M70, with 28" flanged barrel (meaning it has a coarse thread on outside, to triple cooling area--I made my own barrels this way, but did not do many for customers). Stock is English walnut, oil finished, with two removable butt plates, to give short pull for standing and sitting, longer for prone. Rear sight is 1/8 minute Vaver, no backlash at all..has Merit disc. Front sight is International with a spirit-level attachment and fitting for taking a black elastic mirage shield. Bolt sleeve has a gas deflector added.

Along with rifle are gloves, clips, shooting stool...I intended to give old leather shooting coat, but it would be much too large for you. Also a few hundred match bullets and cases. Too heavy to ship and I won't be going through Dallas for three months or so...Bring them then if you want. Don't think I still have a case big enough for this rifle, but will send if I do.

As I said, I want $1200 for rifle.. A lot, but hell, even a Merit disc costs over $50 now!

Yours,

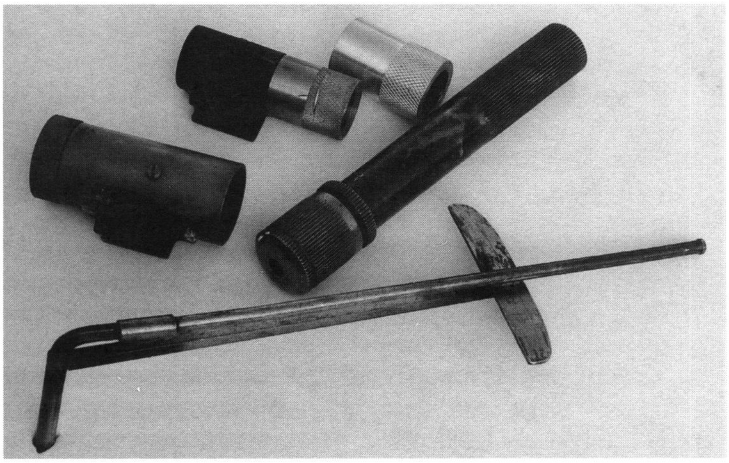
Roy

Roy Dunlap

PS Over

Dope Bag This service is one of the benefits of NRA membership. It is one more reason why every gun owner should belong to the NRA. Have you signed up a new member recently?

This is a copy of Roy Dunlaps letter describing the rifle. It says it all.



Two experimental sights (top), one with an extra sleeve indicate Roy Dunlap's experimental nature. Belding & Mull made the bullet seater (center). At the bottom is an ingenious homemade torque wrench.

A Rifle Named "ROY"

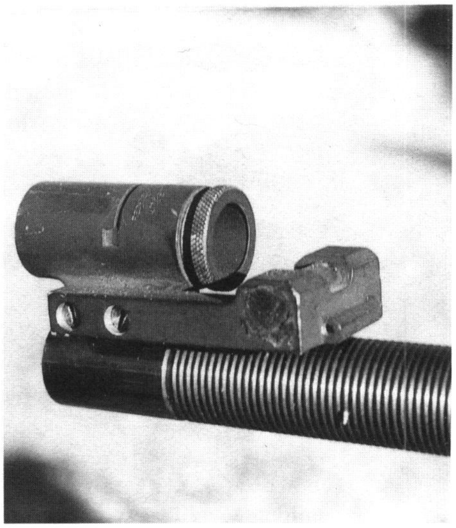
Continued

his experiments. They frequently talked into the late hours of the night. He cherished his friendship with a "legend".

The rifle now resides in Richard's gun cabinet as a reminder of that friendship. He named the rifle "Roy", and he instituted a ritual to honor the legendary namesake. Once a year he loads some ammunition using those original 1964 Lake City brass cases, the 4350 powder, and the Hornady bullets. Then he enters the "Any/Iron" and "Any/Any" matches at the TSRA George Tubb Memorial long-range matches at Fort Wolters and gives it his best shot. In this way "Roy" the rifle shoots again, and Roy "THE MAN" is once again, in spirit at least, on the firing line.

I asked permission to photograph the old rifle and submit it to this magazine in the hopes that it would be published. In that way all the shooters who love shooting bolt rifles across-the-course could share some nostalgia from the days when the 30-06 was king.

Roy Dunlap himself best explains the details of the rifle named "Roy", and his letter to Richard is almost as good as having the rifle talk.



The Redfield "International" front sight has a spirit level attached with a bracket. Note the barrel threading which was done to facilitate cooling. Barrel has 6 grooves and measures 1 turn in 12 inches.

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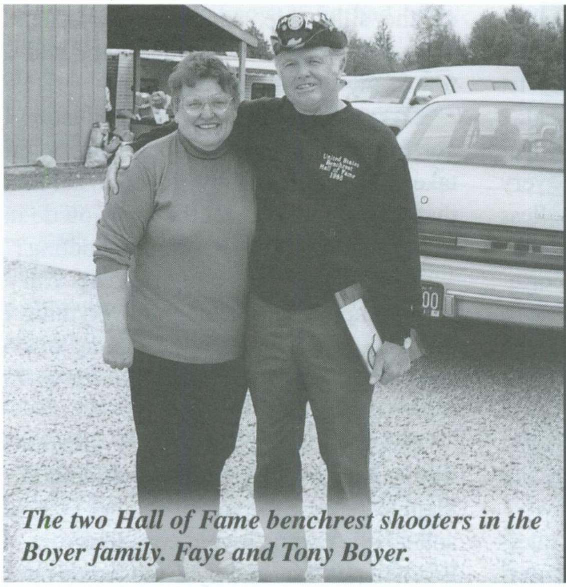


The two Hall of Fame benchrest shooters in the Boyer family. Faye and Tony Boyer.

TONY BOYER Interview

BY DICK WRIGHT

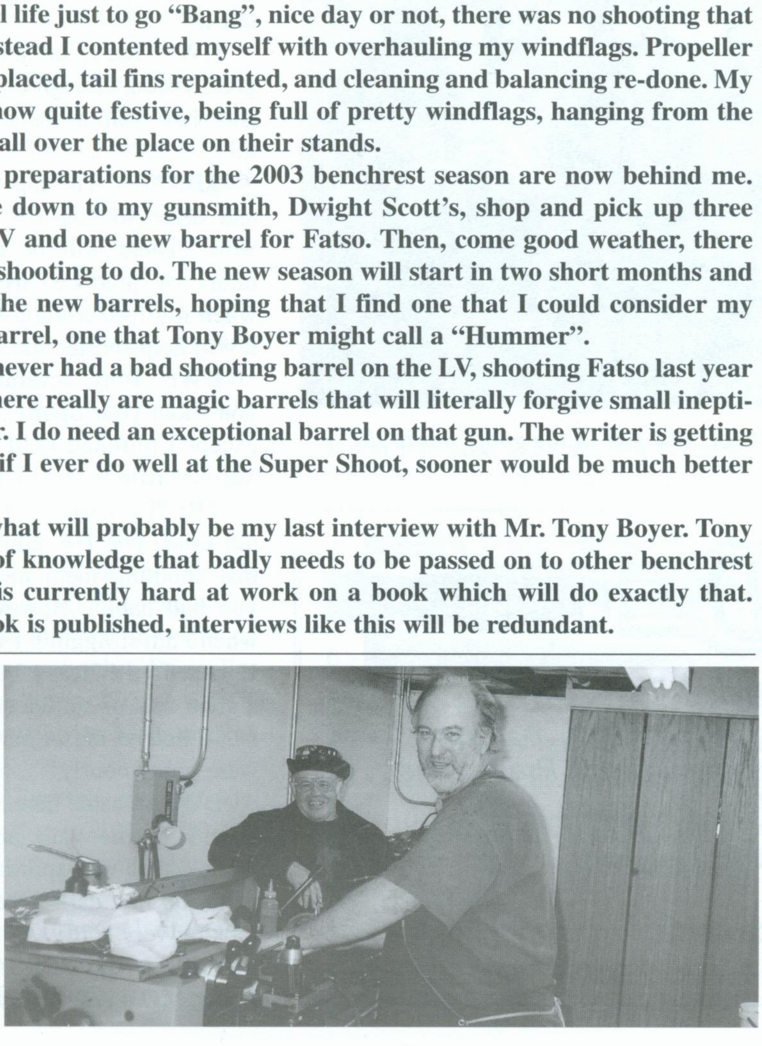
It is now late winter. Yesterday I was taken completely by surprise by a day of fifty degrees and sunshine with mild winds. Since this was sixty-five degrees warmer than a couple of mornings two weeks ago, it felt positively balmy. Alas, on the nicest day of the winter, I was caught with no rifles that needed shooting.

Both my LV gun and the old Heavy Bench gun, Fatso, have only one good barrel each. Since there was no load work-up needed for either rifle and since I refuse to waste good barrel life just to go "Bang", nice day or not, there was no shooting that needed doing. Instead I contented myself with overhauling my windflags. Propeller bearings were replaced, tail fins repainted, and cleaning and balancing re-done. My office/library is now quite festive, being full of pretty windflags, hanging from the ceiling or sitting all over the place on their stands.

The first real preparations for the 2003 benchrest season are now behind me. Soon I will drive down to my gunsmith, Dwight Scott's, shop and pick up three barrels for the LV and one new barrel for Fatso. Then, come good weather, there will be plenty of shooting to do. The new season will start in two short months and I must sort out the new barrels, hoping that I find one that I could consider my "Super Shoot" barrel, one that Tony Boyer might call a "Hummer".

While I have never had a bad shooting barrel on the LV, shooting Fatso last year taught me that there really are magic barrels that will literally forgive small ineptitudes in a shooter. I do need an exceptional barrel on that gun. The writer is getting no younger and, if I ever do well at the Super Shoot, sooner would be much better than later.

Following is what will probably be my last interview with Mr. Tony Boyer. Tony has a vast store of knowledge that badly needs to be passed on to other benchrest shooters but he is currently hard at work on a book which will do exactly that. When Tony's book is published, interviews like this will be redundant.



Tony Boyer and Dwight Scott in Dwight's shop. Dwight is chambering a barrel. Tony is supervising.

Each year Tony Boyer makes a pilgrimage to Michigan, to the home of our mutual gunsmith, Dwight Scott. For several years now I have taken advantage of the fact that Dwight lives just two short hours South of me via expressway and spent a day interviewing Mr. Boyer while Dwight worked on the barrels Tony has collected for the next year's competition.

Much has been written and even more speculated regarding the barrels Tony Boyer shoots in benchrest competition. Rumors are rife on the Benchrest Central web site on the internet that Tony gets all the free barrels he wants. There is also much speculation that Tony's barrels are hand picked by the maker, that he only gets the cream of the crop. I asked Tony about this last year and got a big laugh. While his answer was much longer, it is fair and accurate to say that the "Hand picked barrel" rumor is the purest baloney. (Saying it in this manner gets it by the censors, Tony's answer is more colorful.)

Last year Tony actually had two free barrels; experimental barrels that the maker had given him to shoot and evaluate. Most of the rest of the barrels that he had, he had won at the Super Shoot and at the I.B.S. and N.B.R.S.A. Nationals where the maker, Shilen, Inc. gives barrels to those who win aggregates, guns and two guns, etc. Those barrels that he had not won, he paid for himself. Should our readers want those free barrels instead of having Tony get them, all they have to do is beat Tony at

Continued on next page

Tony Boyer Interview

Continued

the above matches. Have at it, gentle reader.

As regards the infinite supply of barrels, Tony had eighteen with him last year, a number the writer would like to have. However, if you take into consideration that Tony and Faye, his wife, each have rifles to shoot in all classes in the big matches, that makes for only a few barrels per rifle.

The only reason I address this issue before getting into the meat of the interview is the large amount of erroneous speculation that goes around the benchrest community and on the internet regarding Tony Boyer and his barrels. I did not bring up the barrel issue with Tony this year, having already covered it.

For the last two years, Jim Kelbly, Managing Director of the Firearms Industry Super Shoot, has graciously let me shoot next to Tony at the big event. I am convinced that the reason Tony Boyer either places highly or wins most every year has nothing to do with an endless supply of magic hand-picked barrels. To anyone lucky enough to have the opportunity, watching Tony shoot can have a wonderful learning experience. The man is a lot better than most of us when it comes to shooting in the difficult conditions normally found at Kelbly's Range in May, that's why he wins. Thank you, Jim Kelbly, for letting me shoot with Tony.

This year, in preparation for the interview, I asked on Benchrest Central (www.benchrest.com) for questions that other shooters might have for Tony Boyer. Although some of the questions were a tad on the silly side, some were excellent. Tony's answers to those questions and a few of my own as follows...

Most of the Top Twenty at the 2002 Super Shoot. The guy in the goofy hat in the front row won.

DW: "Tony, many of the questions I got from the internet were about what it takes to become a Tony Boyer. What is it that drives you to excel the way you do in a sport as difficult as benchrest shooting?"

TB: "Dick, it's just my makeup. I'm a very competitive person and everything I do, I do full throttle. If I'm going to do something, I will do what I have to in order to do it well."

DW: "I think most of those questions were really about what it would take for them to become the sort of shooter you are and have a competitive record like your's. Nobody put it in exactly those words but I think a lot of the guys wanted to know how they can become or be like Tony Boyer."

TB: "First, you have to have the drive. You have to want to do well badly enough so you will work hard enough and long enough to achieve your goals. Then you have to do the work.

Secondly, you need some natural talent."

DW: "You're talking about things like good vision, enough coordination to walk and chew gum at the same time, that sort thing?"

TB: "Yes. The big thing is the desire and drive so you are willing to do the work. There will be many, many long hours of practice involved. Hopefully, when my forthcoming book is published, it will help shorten the learning curve."

DW: "Tony, several readers asked if you shoot your Sporter rifle in all classes except Unlimited or if you use a Heavy Varmint rifle in the 13-1/2 lb. class."

TB: "I use the 10-1/2 lb. gun most of the time. The HV guns are so forgiving that shooting them too much can teach you bad habits. However, as you know, when I am struggling I will get out the old Hart-actioned Heavy Varmint gun. I have a great deal of confidence in that rifle and it has helped me in matches when things were going poorly."

DW: An aside here... Tony had the old Hart HV rifle with him for Dwight to work on. It was sporting a new looking paint job in a dark metallic grey and was looking very spiffy. As I recall Tony used that rifle at the NBRSA Nationals in St. Louis, MO a few years ago in the HV 200

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yd. match. I don't know if he had been struggling before he got the old HV gun out but he sure didn't when he shot it. He won the event by shooting five consecutive 3/10" groups at 200 yds. These were actual 3/10" groups, not a M.O.A. measurement.

DW: "Tony, there has been a great deal of interest in your school where you spend a day with a shooter, one-on-one, go over everything he does regarding loading, shooting, bench technique, reading conditions, etc, and teach him whatever is necessary to improve his shooting game." "People have asked about the cost of the school and the locations you will be teaching at this year. They want to know if you will hold classes at Kelbly's or in Phoenix, for example, before and after the big matches. They were also interested in the cost and one guy asked if you would teach more than one student at a time. He wanted to take your class with his wife."

TB: "The cost is still two hundred dollars a day plus expenses per student. Arrangements can be made by calling me at home. My number is 540-269-2573. I will be at several ranges around the country this season."

"Regarding teaching more than one student, I prefer to work with just one student but will teach a maximum of two at a time. However, I had a situation last year where I had two students and one insisted on doing all the talking and asking all the questions. He did it all day and it didn't work very well. If I teach more than one student, they are responsible for getting along. Hopefully, teaching a husband and wife together would work out well."

DW: "Thanks, I hope that clears up some of the questions about your school. Moving on, one fellow said his 10-1/2 lb. gun was more "lively" on the rests than a heavier rifle. I think we all agree with that. He asked if you shouldered the rifle or used thumb pressure to hold it. Basically, he wanted to know how you cope with a Sporter and it's tendency to jump around on the rests."

TB: "As far as Sporters go, anybody getting into the sport should buy a 10-1/2 lb. rifle first. That way he can shoot it in all classes at any match."

"On shooting one, I shoot all my rifles

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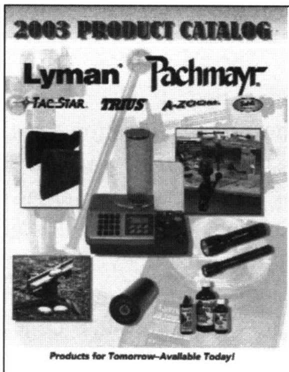

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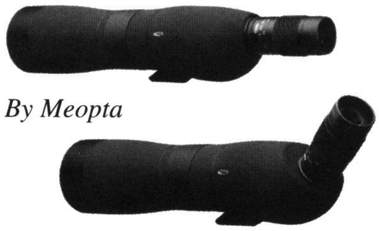

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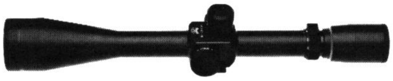

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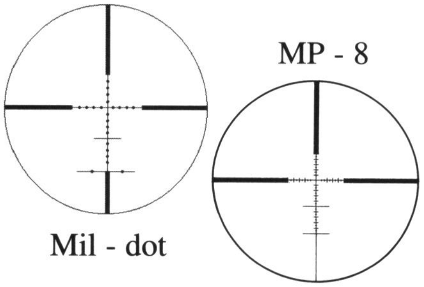

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Tony Boyer Interview

Continued

"free recoil" and do not touch the rifle with anything except my trigger finger while firing. A lot of mistakes are made by inadvertently touching the rifle when you are shooting."

DW: "Along the same vein, do you use a weight system in your Sporters? How important is balance? Will you give up barrel weight to achieve what you regard as perfect balance?"

TB: "Yes, I think the balance of a bench rifle is extremely important. It's important enough to me to give up barrel weigh in order to achieve perfect balance. This has a big effect on how your rifle rides in the rests and what it does under recoil. This is the short answer and will be covered in much more detail in the book."

DW: Another aside. The Scott/Scoville Farley actioned rifle with which Tony won last year's Super Shoot has a weigh system in the butt stock (it comes on all Scoville stocks) which allows one to adjust the balance of a rifle and its bag riding characteristics.

Also, the next question regards "Runners" and "Pickers" which are the two shooting styles most of us use in benchrest shooting. Runners will wait for a wind condition that they think might stay around long enough to get five well aimed shoots off before that condition changes. Runners normally will settle for a 100 yard group around 2/10" without worrying about any of the really tiny groups our rifles are capable of shooting nowdays. Most often, especially in windy conditions, runners will win the aggregate and the one and two gun awards at matches.

In contrast, pickers wait and try to shoot in a specific condition that, they hope, will allow them to shoot very small groups. When everything works pickers can shoot very small groups and they usually win the small group awards at matches.

The writer is a picker and has found it to be a very risky business. When my plan works, and it sometimes does, I win small group awards at matches. However, I have enough "four and one" targets here in my office to paper the inside of a 747 hanger. These targets feature four shots in a very small hole and one misplaced shot which, kindly put, is someplace else on the target. Back to Tony...

DW: "Tony, several people asked about your shooting style. Do you consider yourself to be a runner or a picker?"

TB: "Both. I like to shoot my five record shots as quickly as I can, given a good condition that might stay around long enough for me to get them off. My goal is to shoot five well aimed shots in fifteen seconds. However, as you know, this isn't always possible. When I have to, I will pick away and take whatever the conditions will give me."

DW: "Tony, what is the most important thing that one must do in order to be competitive in the major matches?"

TB: "Practice. You have to shoot enough to know what your rifle will do in most all weather and windy conditions. You must shoot until you are comfortable shooting in most any conditions the range might throw at you."

"Hopefully, when my book in done, it will help shorten the process one must go through to reach a really competitive level of shooting."

DW: "Tony, one shooter asked what it would take to reduce the already small aggs that are needed to win major matches. In most of the majors, a "teen" aggregate is required to be competitive unless the conditions are terrible. Can anything be done to make them smaller yet? Also, what do you think would be the next major change in the equipment available to us that will allow us to shoot better?"

TB: "I think the next big improvement in our equipment will be a better powder. Maybe something less heat and humidity sensitive. We can use some help there."

"Maybe some changes in the rules regarding our rifles and bench equipment would help in reducing our agg sizes. The rules are pretty specific and don't really allow for a lot of invention. However, I would not want to see any kind of a return-to-battery set-up allowed in the Varmint Classes. Those guns are meant to be shot off sandbags."

DW: "Tony, as regards the powder. It is

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Tony Boyer Interview

Continued from page 48

well known that you shoot "T" powder which hasn't been made for some time. Eventually, you have to run out of your supply. What will you shoot when your "T" is no longer available?"

TB: "Probably VihtaVouri 133. Right now it wins more than anything else. Hopefully when the time comes we will have something even better available. I use the "T" now because I like and know it. I have shot with it so long that I know what to expect and what to do when conditions change."

DW: "One person asked about your old Hall actioned rifle, serial # 130. How long did you shoot it and how much did you win with it? How many barrels did that rifle have?"

TB: "I shot one match in 1978. I started shooting a lot in 1979. I shot that Hall or my old Hart HV in everything except Unlimited until 1987. Everything I won (again except Unlimited) during that time was with those rifles. I don't know exactly how many barrels I had for that gun over the years but it would have to be more than fifty."

DW: "There were a number of questions regarding the value of equipment vs practice when it comes to winning in our sport. Is a rifle that is tuned to shoot very small "Ones" required to win matches nowdays or will the best and most practiced shooter win most matches?"

TB: "The most important thing is practice and familiarity with your rifle and being able to shoot it in challenging conditions. A rifle that will shoot low "twos" can win matches. That's up to the shooter."

DW: "One person asked about gunstock material. Do you believe that the wood and carbon fiber used in many contemporary stocks is beneficial in dampening vibration?"

TB: "I like and use the wood stocks. They seem to work very well."

DW: "The same person asked if you felt there was life beyond the 6PPC cartridge. Will something better come along? Speaking for myself here, there are a lot of these questions on the internet. I think the whole topic is mostly redundant. The PPC cartridge can easily shoot better than we can shoot it in the conditions of a normal match."

TB: "I don't know. It would be very hard to do better than a 6 PPC."

DW: Another note: The same person asked what Tony's favorite food was and I neglected to ask him. However, I can make a couple of observations on this topic from personal experience... First I have eaten way more "Quarter Pounders" (AKA "Cholestrol Bombs") with Tony Boyer and Dwight Scott than any of us needed.

Secondly, one of the more comical sights in benchrest is to witness five hundred plus pounds (way plus) of shooter and gunsmith (read the writer and Dwight) trying to drag one hundred sixty pounds of Tony into the Chinese buffet that is right down the road from Dwight's and which has really good Chinese food. That's one cat fight we haven't won yet and, you won't believe... such language!

DW: "Tony, one person asked about your new 1.500" Pacific reamer. How does the rifle shoot with a chamber from that reamer?"

TB: "The same as my other reamers. I can't tell any difference."

DW: "Tony, one person asked what you have against score shooting."

TB: "Nothing. As soon as I learn to shoot group, I will probably give it a try."

DW: "One person asked if the best shooter will usually win a match or the person with the best equipment. He went

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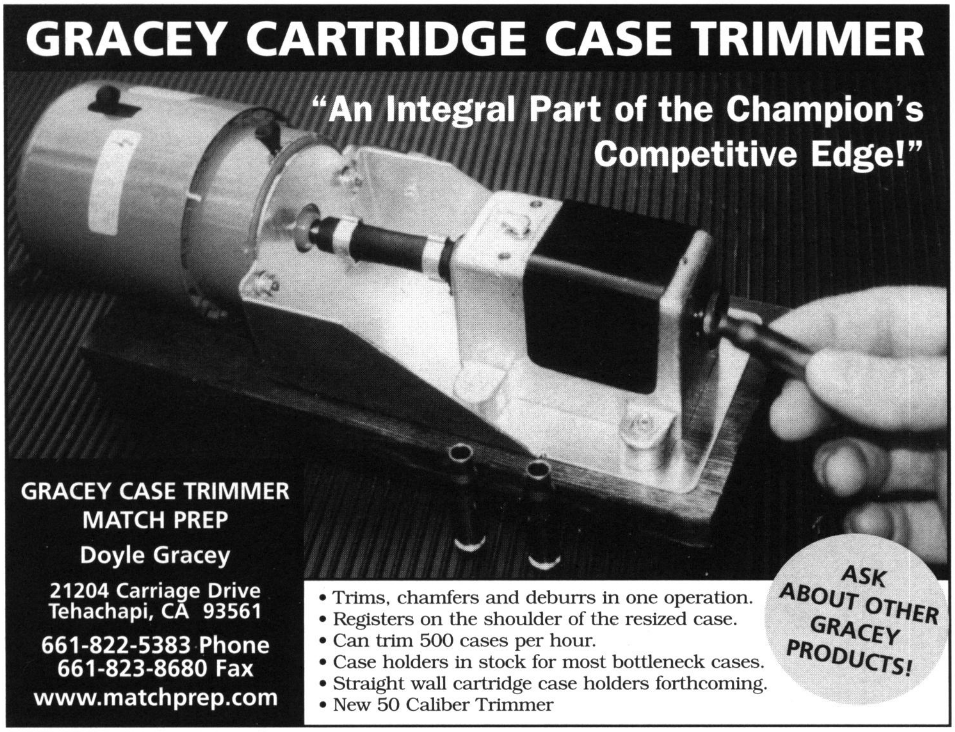

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Tony Boyer Interview

Continued from page 50

on to say that, should the equipment be the deciding factor, it would seem to be better to spend money on barrels than attend a school such as you put on. He went on to say that, in his opinion, the shooter and his wind reading skills were more important than the equipment. Do you Agree?"

TB: "Yes. The best shooter will usually win. Knowing what to do in conditions is the most important."

DW: "Someone asked what your biggest thrill has been in benchrest."

TB: "There have been many. Winning my first Super Shoot was a big one. But the biggest thrill was probably winning my first Benchrest Hall of Fame point. That was important to me."

DW: "How long did it take you to win that first point?"

TB: "I shot in my first match in 1978. It was just one match that year and I shot a .222. I attended a benchrest school put on by the I.B.S. shortly after that. I won that first point the next year in 1979, my first full year of competition."

DW: There were many more questions for Tony, mostly about brass prep, equipment, bench technique, range evaluation and shooting in the wind that Tony did not want to answer in this interview. He said that many of the topics already occupied a whole chapter in his forthcoming book (As I write this there are over a hundred pages completed) and that he would prefer to answer them therein.

Although there is already much work completed on the book, there are still many questions to be settled and many pictures to be found and taken before the work is complete. There has been more than one offer to print and publish the book. This issue is under consideration and a decision should be made shortly. It is fairly certain that Tony's book will be advertised herein and sold by Precision Shooting, Inc. no matter who prints it. This writer has every intention to be one of the first buyers, hopefully of an autographed copy.

Dick Wright
Staff Writer

P.S. David, This is the first interview with Tony Boyer that he has not read and approved before I sent to you for publication. As I finish this Tony and Faye are on an extended trip to the South and Southwest, putting on benchrest school sessions and shooting in matches. With a deadline looming there is no way for me to get it to Tony without missing the deadline for the current issue.

Therefore I would like to apologize to Tony for any mistakes I might have made herein. It is certainly not my intention that there would be any. I want to thank you for your patient cooperation and wish you great success with your book.

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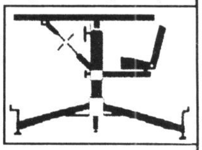

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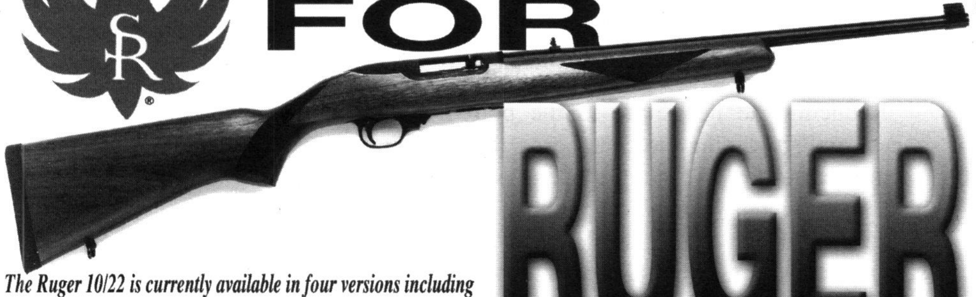
RIGHT STUFF FOR THE RUGER 10/22



The Ruger 10/22 is currently available in four versions including this sleek deluxe model. It has been popular for its good looks, frugal price tag and wide availability of after-market equipment.

BY FRED STUTZENBERGER

The Ruger 10/22 autoloader has been a very popular .22 rifle since its debut four decades ago. In a previous article[1], modifications were described for improving the grouping precision of the little rifle. Several stock modifications, and the replacement of the factory barrel with a heavy match barrel, resulted in sizable improvements in grouping, yet did not consistently achieve minute-of-angle precision (<0.54" groups at 50 yards). In subsequent experiments on the factory barrel, simple and inexpensive machining and shimming operations yielded comparable reductions in group size using a variety of high velocity and standard velocity ammo. This article provides step-by-step instructions for the economical modification of the factory barrel to improve its grouping performance.

Before modification, a baseline for comparison of before-and-after performance was established by firing a variety of ammo from a rest for groups at 50 yards. Based on the recommendations of Davis[2], three 5-shot groups were fired with each type of ammo after conditioning the bore with 5 shots fired off target (Table 1). Each box of ammo was marked and the remainder of the contents saved for the "after modification" tests to eliminate lot-to-lot variation. The average group size for "before-modification" performance by all five ammo types was 1.17" measured center-to-center. The average standard deviation (a statistical measure of the variance within a set of values) was 0.24". In practical terms, the measurements for two out of the three groups within a set should fall within one +/- standard deviation range of the average for that set[3]. For example, with the Federal Gold Medal Target Ammo, 2/3 of the groups would measure in the range of 1.24" to 1.58".

For an informal basis of comparison, I asked an experienced competition rifleman to test some of his unmodified "out of the box" .22 rifles with a variety of standard velocity and high velocity ammo. The overall average group he shot from a rest at 50 yards was 1.12" center-to-center with an extreme range of 0.61" to 1.53". The grouping performance of the Ruger 10/22 compared favorably with both the average and the extreme range of group sizes established by him with his rifles and ammo. Assured that the Ruger 10/22 was comparable to other rifles in its price range, I began modifications in an effort to improve its grouping performance.

The Ruger 10/22 is especially amenable to barrel removal and modification. Removal of a single screw through the underside of the stock allows the barrel/action assembly to be lifted out (on the carbine, a band holds the fore-stock against the barrel; it can be removed with a single screw). Two Allen head screws draw the barrel back into the receiver via a lug that locks into the barrel recess (Fig. 1). Removal of those two screws allows the barrel to be withdrawn from the front of the receiver. ***The bolt should be locked***

Continued on next page

Table 1

Grouping precision of Ruger 10/22 before reducing headspace

Cartridge	Smallest	Largest	Average	Std.Dev.
Federal Gold Medal Target	1.29	1.61	1.41	0.17
Federal Gold Medal Match	0.75	1.21	0.99	0.23
Federal Lightning	0.69	1.39	1.03	0.35
Remington Target 22	0.94	1.38	1.20	0.23
Winchester Super-X	1.05	1.48	1.23	0.22

All values were measured in inches center-to-center for three 5-shot groups shot from rest at 50 yards.

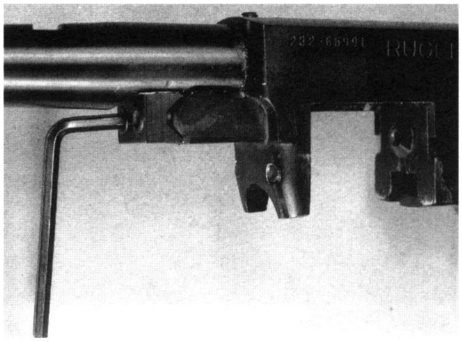


Fig. 1. Removing the barrel of the Ruger 10/22 requires the use of a 5/32 Allen wrench.

Right Stuff For The Ruger 10/22

Continued

in the open position and the rifle inspected to make sure that the chamber is empty before removing the barrel. Barrel removal can then be done with a gentle twisting motion as the barrel is pulled directly forward from its recess. The barrel should not be rocked from side to side during removal.

The autoloader is the dirtiest of all actions, due to the blow-back of fouling into the breech area. Therefore, if the rifle has been fired before barrel removal, the accumulation of powder/primer residue on the face of the breech will be apparent (Fig. 2). With every shot, the bolt flies forward to pound that residue into a compacted layer on the face of the breech. Since .22 rimfire headspace is measured on the rim, the fouling layer will increase the already excessive headspace. An eyeball estimate of the slop in the headspace can be made by chambering a cartridge, removing the magazine, turning the rifle over and wiggling the cartridge back and forth with a knife blade or other thin tool (Fig. 3).

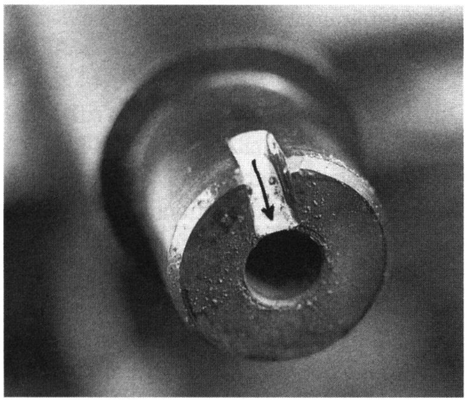


Fig. 2. This fouling accumulation on the face of the breech will effectively increase headspace. Turning and polishing the face of the breech will reduce the tendency to collect fouling. After machining the breech face, the extractor slot (arrow) must be deepened to ensure adequate engagement of the extractor with the case rim.

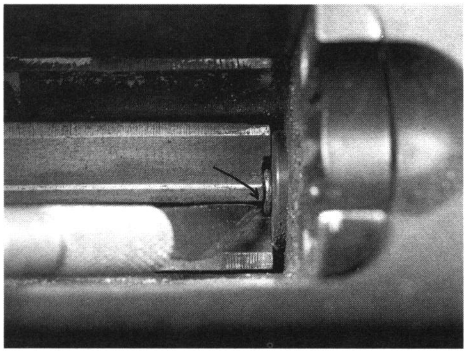


Fig. 3. Excessive headspace (arrow) can be demonstrated by moving the cartridge back and forth within the chamber.

Reducing the headspace in the bolt recess and shortening the chamber in the factory barrel are two simple operations that will tighten groups. The chamber shortening operation on the barrel was done first. A homemade chamber depth gauge was turned in the lathe from a piece of 1/4" diameter copper rod. Slugging the bore gave a land-to-land dimension of .218" and a groove-to-groove dimension of .224" as measured by a dial caliper graduated in .001". The business end of the gauge was turned to a diameter of .220" with a total length of 1.050". The distance between the front of the rim of a .22 match long rifle cartridge (Federal Gold Medal Match) and the front of the bullet belt miked out at .725". The chamber gauge could be inserted into the Ruger factory chamber to a depth of .768", calculated from the .282" of the gauge that was protruding from the breech (Fig. 4). Excess chamber length was calculated as:

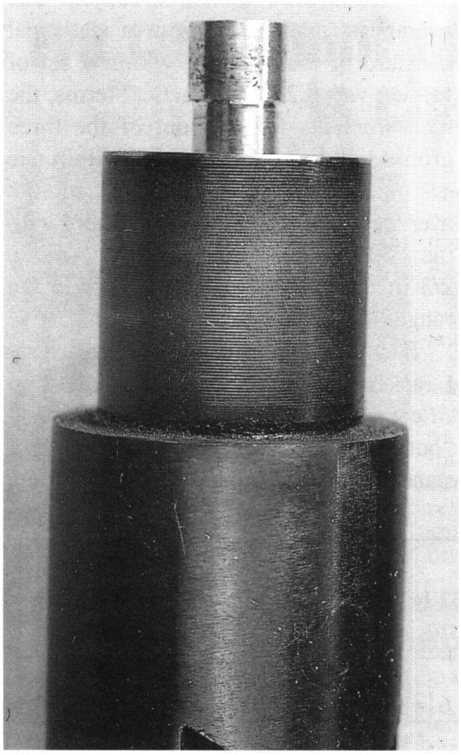


Fig. 4. The homemade chamber depth gauge in use. After insertion to the point where the rifling lands start, the amount that protrudes is subtracted from the total gauge length to get the effective chamber depth.

Depth of the chamber = .768"
-Case rim to bullet belt = .725"
Excessive chamber depth=.043"

The diameter of the factory barrel is a straight .920" at the breech and then tapers down to .555" at the muzzle. Although the barrel could be turned in a three-jaw chuck on the lathe, I used a 59/64" collet; the collet has less run-out and risk of marring the blued finish. I removed .042" from the face of the breech, carefully facing off .005" at a time and testing the fit with several .22 cartridges between each pass. The last two passes took off only .001" each. After the last pass, a hint of resistance was felt when a Federal Gold Medal Match cartridge was gently pushed into the *clean* chamber with a finger tip. *Remember: an autoloader does not have the strong camming ability of a bolt action. So don't get greedy and hope that the forward momentum of the autoloader bolt will force the bullet belt into the rifling—it might and it might not.* The total time for this operation was about 32 minutes including lathe clean up.

The remaining 0.001" was removed from the turned breech face by polishing with several grades (320 to 1200 grit) of

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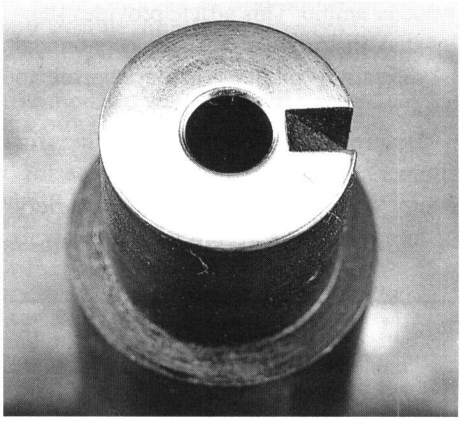

Fig. 5. When polishing the breech face with abrasive, be sure to push a little wad of cotton down into the chamber. When it is pushed out, it will carry the bulk of the abrasive with it. Note: after turning and polishing the face of the breech, the extractor slot must be deepened to allow adequate engagement of the extractor claw with the case rim.

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Right Stuff For The Ruger 10/22

Continued from page 54

silicon carbide paper backed with a flat piece of wood; a nicely polished surface was the result (Fig. 5). The rationale for polishing was that a slick surface would collect less powder/primer residue than the rough turned factory finished breech.

After polishing the face of the breech, the sharp edge of the chamber must be chamfered or it will put nasty scrapes on the bullet as the cartridge is being chambered (Fig. 6). The chamber edge was relieved with a 5/16" ball-shaped rotary burr in a variable speed hand drill running at the lowest practical speed. A cleaning patch was inserted between the chamber opening and the tool. This trick reduced chatter and drew the shavings away from the cutting flutes to prevent their scoring the machined surface (this patch trick works well for crowning muzzles also).

After relieving the sharp edge, a little polishing tool was made by drilling partially through a lead ball. I center-drilled a .32 caliber muzzleloading soft lead ball and left the bit sticking in it. A piece of 320 grit silicon carbide paper was attached to the ball with a bit of Scotch double-stick tape so that the paper would rotate between the ball and the entrance to the chamber (Fig. 7). This was repeated with 600 and 1000 grit papers, then finished off with crocus cloth to give the chamber entry a fine polish.

On the Ruger 10/22, the rim recess is cut into the face of the bolt rather than into the barrel. Also, like the face of the breech, the face of the bolt will collect a layer of powder/primer residue. This accumulation is apparent after the barrel is removed so the face of the bolt can be viewed head-on (Fig. 8). Any fouling accumulation on either the breech or bolt will increase effective headspace. The bolt was removed and the headspace depth was determined to be 0.051 inch. After measuring the rim thickness on a variety of .22 ammo, I decided that the headspace could be reduced to 0.040 inch. The bolt was clamped in a machining vise that had been indicated in for true 90° to its cross-travel on a Bridgeport milling machine; alignment with a dial indicator is essential to ensure that the face of the bolt remains at a true right angle to its sides. A carborundum grinding stone (Sears #64719) running at 3000 rpm took off a

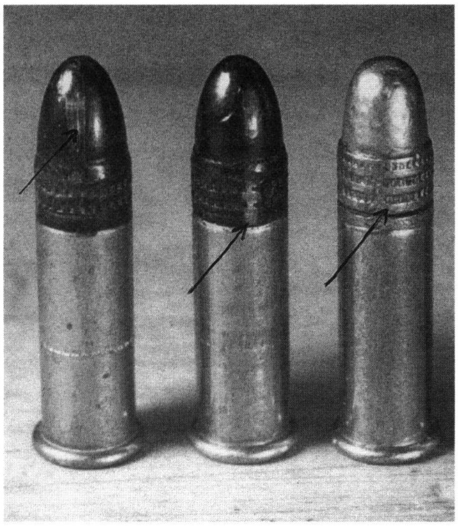

Fig. 6. If the sharp edge of the chamber is not relieved, it will scuff the bullets (arrows) as the cartridges are chambered.

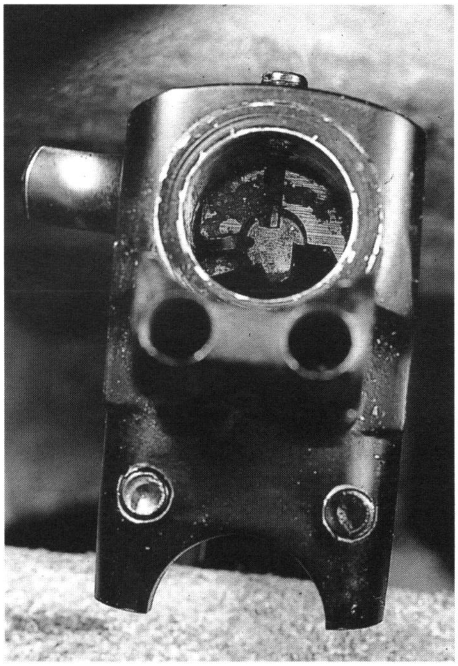

Fig. 8. Removal of the barrel allows direct inspection of the face of the bolt; this one has a layer of powder/primer fouling that in itself increases headspace.

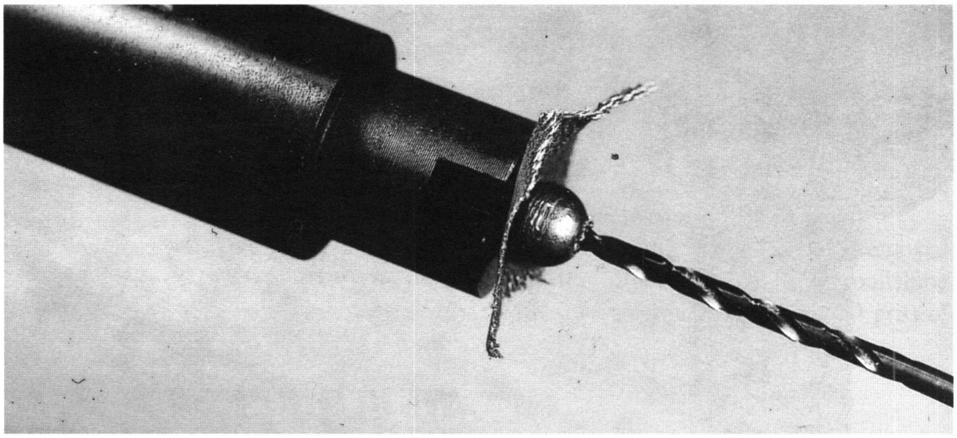

Fig. 7. A final polishing of the chamber entry was done with a lead ball and various grades of abrasive paper.

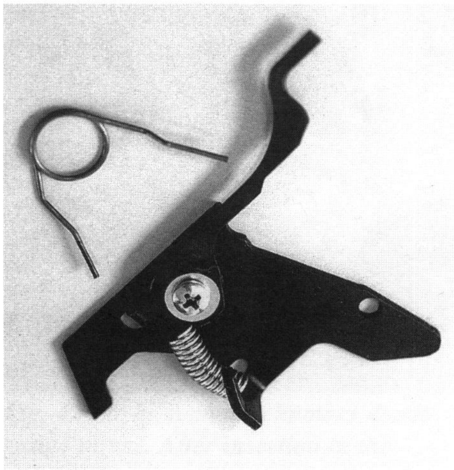

Fig. 9. The CST automatic bolt stop parts shown here replace the original bolt stop, bolt lock spring, ejector and ejector pin.

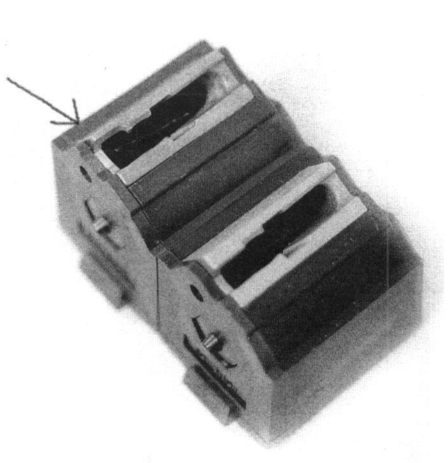

Fig. 10. The slight (but absolutely necessary) modification to the Ruger rotary magazine (arrow), compared to an unmodified magazine.

thousandth of an inch at a time from the face of the bolt. The total time for this grinding operation was 12 minutes.

While the receiver was disassembled, I decided to upgrade the little rifle by installing an automatic bolt stop in the trigger assembly. Custom Shooting Technologies (see supplier's list) has produced easily installed parts (Fig. 9) that automatically stop the forward travel of the bolt upon its full retraction when the magazine is empty or removed. Upon the ejection of the last spent round, the absence of a cartridge in the chamber will automatically actuate the bolt stop. It is surprising that Ruger did not incorporate such a mechanism into the rifle in the original design. In any case, it is a nice safety feature; when that action locks open, it provides visual proof that the rifle is indeed unloaded rather than having the bolt slam shut on what is should be an empty chamber.

Following the detailed instructions provided with the automatic bolt stop kit, it took about 17 minutes to install once the trigger assembly was removed from the receiver. I have had both formal and informal training in various aspects of gunsmithing. **For someone unfamiliar with the interrelationship of parts and their function in the trigger mechanism, it is advised that a qualified gunsmith do the installation.**

Once the automatic bolt stop is installed, it is so easy to use (and get used to) that one might wonder how they ever got along without it. One caveat in that regard: the bolt stop will function properly only with rotary magazines modified as shown in Fig. 10. CST provides one modified magazine with the bolt stop kit and will modify magazines for a nominal fee. As pointed out in the CST instructions, *"failure to use a CST modified magazine could result in an unintentional loading and a subsequent unintentional discharge of the rifle resulting in serious injury or death"*. 'Nuff said!

During the re-assembly of the barrel into the receiver, it was noticed that the draw lug that secures the barrel in the receiver cocked at an angle when the two Allen head screws were tightened down. A 0.015" thick metal shim were inserted between the draw lug and the receiver to improve the alignment of the two parts. A similar shim was inserted between the

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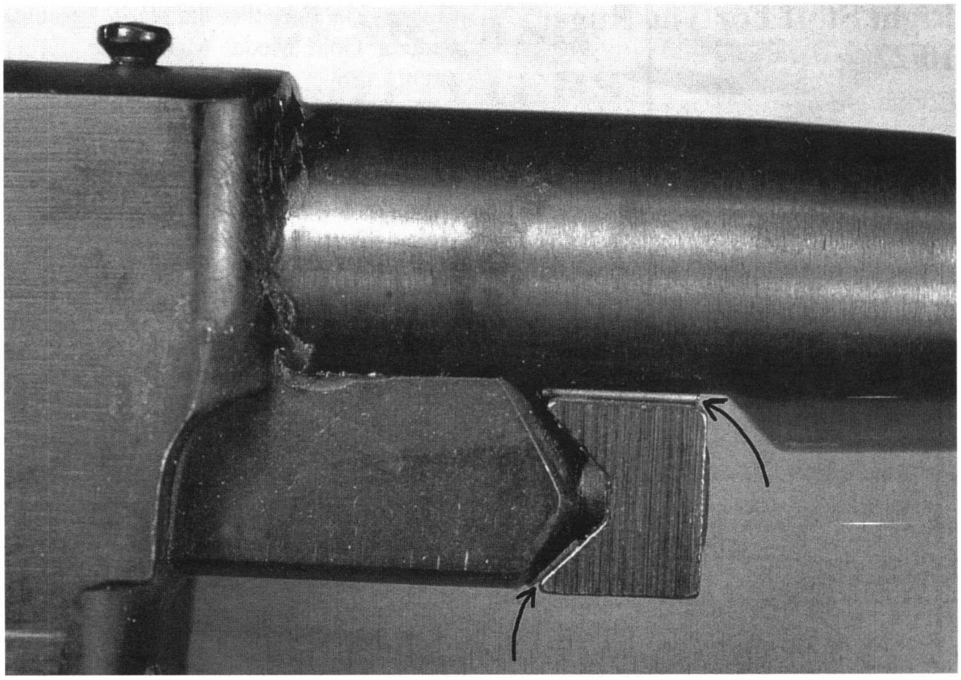

Fig. 11. Metal shims between the V-shaped draw lug and the barrel, and between the lug and the receiver extension, are indicated by arrows.

Table 2

Grouping precision of Ruger 10/22 after reducing headspace

Cartridge	Smallest	Largest	Average	Std.Dev.
Federal Gold Medal Target	0.81	1.26	0.99	0.24
Federal Gold Medal Match	0.56	0.83*	0.65	0.16
Federal Lightning	0.41	0.52	0.48	0.06
Remington Target 22	0.74	1.42	0.97	0.27
Winchester Super-X	0.58	1.27	0.90	0.35

All values were measured in inches center-to-center for three 5-shot groups shot from rest at 50 yards.

*This group would have been 0.35 inches except for one flier.

An observation—when you shorten the chamber, you are in effect, changing seating depth. Seating depth is one variable that generally has a large impact on accuracy when reloading center fire ammo. Best accuracy is generally found with the bullet seated near or into the lands. This is consistent with what you found, since after your mod the bullet was closer to the lands and accuracy improved. Many people work up loads starting with the bullet seated hard into the lands, increase powder charges until pressure signs are seen or velocity goal is met, then start adjusting seating depth until best accuracy is found. The reason for starting with bullet seated into the lands is because that will produce the most chamber pressure, if you had done things the other way around, you might get into an unsafe condition when you started to seat into the lands.

Since adjusting the chamber depth is in essence changing the seating depth, did you perhaps stop every .005 and check accuracy? Since you were using a collet, it seems like this would be very easy to do. If you didn't I'm sure you could find a ready supply of people willing to donate their 10/22s for accurizing if not just for pure science!

Did you measure how much variability there was in placement of the bullet belts? I would expect (or at least hope) that it would be very uniform within a particular brand, but may vary from brand to brand or even lot to lot. Did you pick the Federal Gold Medal because it had the greatest length from front of rim to bullet belt?

Right Stuff For The Ruger 10/22

Continued

barrel and the draw lug to firmly support the free-floated barrel (Fig. 11).

These modifications resulted in reductions of group sizes with all ammo tested (Table 2). For the standard velocity Federal Gold Medal Match and Target ammo, group reductions averaged about 32%. The biggest reduction (53%) was achieved with the high velocity Federal Lightning. Less significant reductions in group size were obtained with Remington Target 22 and Winchester Super-X (19% and 27%, respectively).

In summary, the little Ruger 10/22 cannot be considered a match grade rifle by any stretch of the imagination. However, with a few simple modifications, it has shown itself to be capable of approaching minute-of-angle groups at 50 yards with off-the-shelf ammo such as Federal Lightning. Perhaps other ammo will suit its appetite even better—and finding out what it likes best is half the fun in the care and feeding of any rifle.

Acknowledgments

Thanks to John Cummings and Mark Long for helpful comments during the course of this work.

Suppliers

Custom Shooting Technologies, Inc. cstmtech@yahoo.com or phone 502-592-4467.

References

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2. Davis, W.C. 1969. Determining rifle accuracy. In: *The NRA Handloader's Guide* (A. Halsey, Jr., Ed.), p.136. National Rifle Association, Washington, DC.
3. AT&T Technologies/Western Electric Co. Inc. 1985. *Statistical Quality Control Handbook*. Delmar Printing Co., Charlotte, NC.

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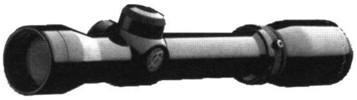

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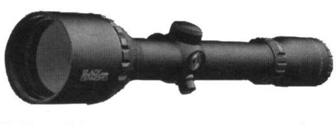

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IS THIS THE FASTEST BORE CLEANER?

BY DAVE SCOTT

When a shooter is confronted with the routine of cleaning a barrel that fouls badly, I've long held the notion that if the fragrance of his chosen cleaning solvent doesn't make his eyes water, that dude's got lace on his pantaloons and copper up his bore. Fact is, the most effective, fastest working bore cleaners have traditionally been laced with ammonia. And if the lucky owner of a fouling barrel isn't using one of those potent products he's probably not keeping up with the copper build-up forming inside.

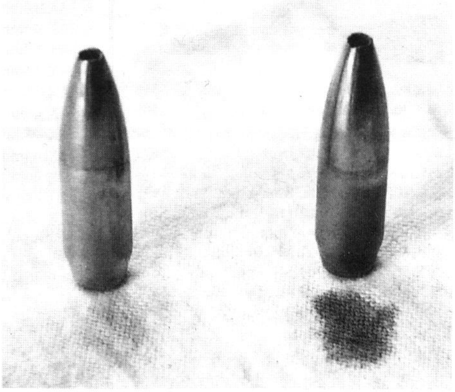
With my own recollections of ammoniated cleaners reaching back to home-brewed concoctions such as Norton's pungent potion and later to always-controversial Blue Goop, I had accepted ammoniated solvents as the way it always had been and always would be. But my world view as it relates to barrel cleaning was upended a few months ago. On a visit with Garland Gilbreath, my gunsmith buddy at Stephenville, Texas, I was surprised to hear him raving about a new bore cleaner that barrelmaker Doug Shilen had recommended to him. After all, Garland's ravings usually are confined to guns and groups. Not content just to describe the excellence of this alleged *wunderklener* called Wipe-Out, Garland decided a demonstration was in order. Grabbing an aerosol can of the stuff, he squirted it into the muzzle of a rifle laying on his cleaning rack until it oozed out the chamber. Scooping some on my finger, I noted that it was nothing more than a wimpy white foam identical in appearance to the stuff used for shaving. Sniffing it, I hooted derisively when I detected only the slightest aroma. I reminded Garland of my tiresome theory that applying a proper bore cleaner will make a grown man cry.

Since the demonstration barrel was a slick Shilen that exhibited only a light copper wash at the muzzle, I wasn't overly impressed when 10 to 15 minutes later Garland declared the bore to be free of fouling. However, I dutifully checked it out and saw that the lad indeed was correct. But considering the scant fouling, big deal.

Nevertheless, after determining that he wasn't unscrupulously conflicted by ownership of Wipe-Out stock, I bought a can from his personal stash and upon arriving at the house stored it with my other bore cleaners. A few days later I fired 10 rounds through my ancient Remington Model 722 in .222. This would be a *real* opportunity for Wipe-Out to strut its supposed stuff. Understand that years ago this Model 722's factory barrel was neglected by a previous owner, and now just a few rounds produce nasty copper streaks easily seen at its rust-pitted muzzle. Since I had just fired the 10 warmish rounds on a blistering Texas morning, I knew that inside lurked an ugly mess. Make no mistake about it: Wipe-Out had its job cut out for it.

Squirting the bore full of foam, I retreated to the kitchen to brew coffee. Probably 30 minutes later I returned, ran a patch through several times and donning my magnifying glasses inspected the barrel's innards at the muzzle. *Incredibly, it was as clean as a hound's tooth.* In a mere half-hour Wipe-Out had accomplished what typically took the better part of a day's soaking in my favorite bore cleaner. Needless to say, I was astonished. I was shocked. I was sold.

Shoving the rifle aside, I fetched a .30-caliber jacketed bullet and squirted a glob of Wipe-Out foam on it. As I watched in slack-jawed amazement, *30 seconds later the white foam had already turned blue where it contacted the bullet!* Lest you miss the significance here, this means that Wipe-Out was already stripping major quantities of metal from the jacket. And in just one-half minute! Never had I seen even the strongest ammonia-laced solvent strip



The lower half of the bullet at left was soaked for two minutes in the fastest working ammoniated bore cleaner I'm aware of, then wiped on the cotton patch upon which it sets. Note the light stain at the bullet's base, indicating a low level of metal removal. In contrast, the stain at the base of the other bullet, soaked for two minutes in Wipe-Out, is dark blue. This is an indicator of major jacket dissolution, as is the dullness of the lower part of the bullet.

away jacket metal anywhere near that fast.

"What's going on here?" I wheezed to myself in disbelief. "What's in this stuff?" Searching the fine print on the can I noted that the only ingredient listed was monoethanolamine. Figuring that any solvent this potent surely would be equally lethal, I scanned the DANGER section. After the usual cover-your-posterior liability disclaimers there was a warning that struck me as considerably more amusing than chilling: "Do not taste or swallow". Indeed, in large type on the front of the container the manufacturer stated that the product is odorless, contains no acid or ammonia and is user friendly. Besides its pleasing lack of odor, I had already noted that it produced nothing more than a slight stickiness on my fingers.

The can further explained that in addition to copper, brass and bronze fouling, Wipe-Out dissolves carbon and smokeless and black powder fouling. Moreover, Wipe-Out was declared safe for gunstock finishes and barrels of carbon and stainless steels. A quick accounting suggested that the only riflemen not accommodated by the new product are those misguided souls who diddle with cast bullets, plus some of the rimfire crowd. Apparently Wipe-Out doesn't strip away lead fouling.

As a rabid advocate of the trust-but-verify concept, I make it a practice never to put a solvent into my *expensive* barrels until I've checked it out. So I grabbed a wafer of barrel cut from the end of a stainless steel Shilen tube that I use for such tests. A flat section of one side of the wafer has been polished mirror smooth, making any damage easy to see. Squirting two separate globs on the test surface, I walked away and left the solvent standing. Five days later the foamy dabs had evaporated into two thin, filmy splotches of liquid residue. Wiping away the film from one of the test spots I saw no underlying pitting or etching. Five days after that (10 days total) I cleaned away the remaining dab. Again, I detected no damage. I also left Wipe-Out puddled on a sectioned piece of chrome-moly barrel for three days, and once again there was no harm. Granted, these exercises amount to an outrageous case of overkill, but they persuaded me that the product is safe for barrel steels, especially when we'd typically leave a bore soaking for minutes or hours, and not days.

According to directions, only patches should be passed through the bore for cleaning, and not a bore brush. Considering the speedy cleaning action—*on metal fouling at least*—I'd guess that the manufacturer considers brushing unnecessary. Besides that, a quick test confirmed that this solvent attacks a bronze brush as enthusiastically as it does jacket metal.

Continued on next page

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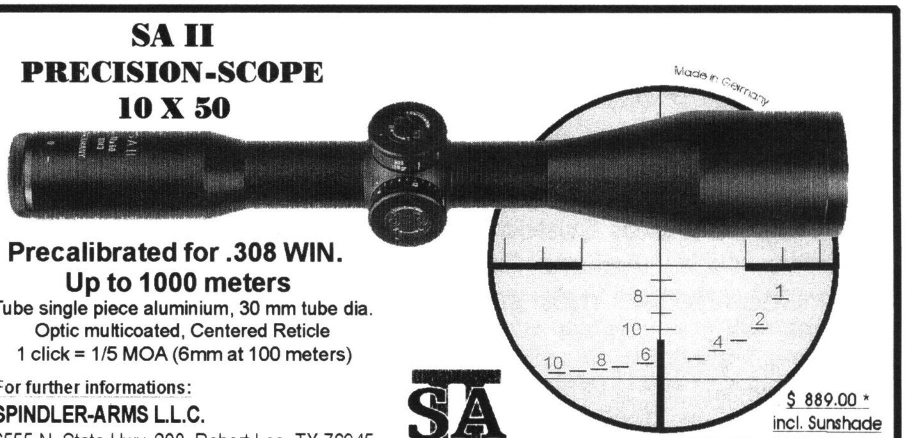

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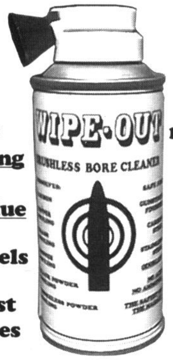

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Is This The Fastest Bore Cleaner?

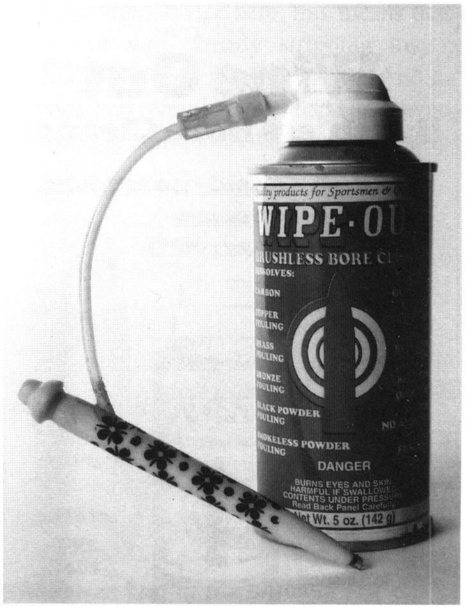
Continued

Although Wipe-Out contains corrosion inhibitors, the company recommends applying a good rust preventative after cleaning for long-term protection.

Granted, Wipe-Out is dynamite on *metal fouling*. But how effectively does this new and different potion act on the dark coatings deposited on naked bore surfaces as a result of propellant combustion? And will it attack the mysterious, constricting ring of powder-related fouling alleged to form just downrange of the throat and reported to be impervious to anything but abrasive cleaners? While it's a straightforward matter to watch copper fouling disappear, gauging the removal of "powder" fouling is a tougher proposition. So although Wipe-Out is *said* to dissolve carbon and powder fouling, I have no way of confirming that it does, or even if it does any better job of tearing into powder fouling than conventional bore cleaners, including those relying on butyl cellosolve.

My only complaint with Wipe-Out (and indeed a minor one) is the difficulty of keeping the expanding foam from creeping into the locking lug area when it's introduced from the muzzle. Although of itself this likely does no harm, I'd prefer that a bore cleaner not mingle with the lubricant on my locking lugs. The situation is easily avoided in bolt-actions by directing the cleaner down the barrel from the chambered end by use of a rod guide, an alternative suggested by the manufacturer. Or if you have too much time on your hands, you can rig something similar to my odd creation. I inserted a short length of small vinyl tubing through a ballpoint pen body and glued the tubing in place, connecting one end to the can's nozzle. I chose a ballpoint body having the proper diameter to seal at the shoulder/neck junction. Thus when the device is inserted through the loading port and pressed firmly against the chamber the foam is neatly confined to the chamber neck and all points forward, inoffensively oozing from the muzzle when the barrel fills.

Wipe-Out is sold by the Paul Co., P.O. Box 194, Paola, Kansas 66071. Phone (785)883-4444 or Fax (785)883-2525. Or email them at *borecleanr@aol.com.* At $11 for the 5-ounce can, we can't accuse this product of being cheap. But after frequent use on two rifles over a period of several weeks, it appears that a can goes a long way. When you combine that fact with its speed and inoffensive composition, seems to me it's well worth the money.



My only complaint with Wipe-Out—that it was designed to be injected at the muzzle—was resolved by rigging this ballpoint pen body to allow the solvent to be spewed from the chamber end, thus keeping it out of the locking-lug well. Although the gay floral motif is an aesthetic delight, this particular pen body was chosen because it's the correct size to insert through the loading port into the chamber.

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The GHOSTS at the TUCKER TOWN BARN

BY JACK BOGER

(Editor: In our immediately preceding April issue of **PS** *we carried the article "***PS** *Visits the Tucker Town Barn", authored by Hoke Kerns. In the course of the article the author remarked about the air movement within the fully enclosed barn structure. The rimfire benchrest shooters who consider the Tucker Town Barn to be their "home range" found out some time ago what the centerfire benchrest shooters found out two decades ago in the Houston Warehouse...namely that as you eliminate more and more variables from the "conditions", you learn, to your surprise, that you have created (or at least unearthed) new conditions to contend with!*

Shortly after the April issue had been bundled off to the printer Hoke Kerns contacted us. He remarked that one Jack Boger had just authored an article on the subject of the strange air movements within the barn, and speculating on their causes and effects. Would I like to see a copy of that article?

Be nice, and I'll share it with you...)

The short article in last month's RBA Newsletter asking for an explanation of the conditions that operate inside the Tuckertown Benchrest Barn led to some interesting conversation. Nobody stepped forward with a single theory to explain things, but there are some interesting ideas circulating that might point us toward the explanation we want. Everything we hear seems to revolve around issues like temperature, humidity, light conditions and the combination of these and a few other elements. We should note that everything discussed here is theory only, although most of it is based on good logic. It's presented simply as something to think about the next time you shoot at the Barn or any other indoor range. If any of it proves helpful that will be good. And if anyone can come up with a better explanation we would all like to hear it.

In discussing the Tuckertown Barn most shooters begin with what they can readily observe and with what seems to have an impact on rimfire rifle performance. One of the first things to come up, then, is temperature. It is assumed by most of us that rimfire match rifles shoot better in warm weather, and with matches at the Barn held during the colder months we can probably conclude that the cold influences scores. Temperature might also help explain why the same gun and ammunition can do well outside in the summer but not so well inside in the winter, or why most guns need to be tuned differently or fed different ammo to do well in the barn. Coincidentally, the two-day match in January provided support for this theory. Those who were there will recall that Saturday was a cold, rainy day but that the sun came out on Sunday and warmed things up by about mid-day. Scores on Saturday seemed about average to below average (for some of us), but on Sunday things got better, particularly in the last match of the day. In that match four competitors shot 250's, and the next four shot 249's. In other words, it looks like scores and temperature were related, at least on that day.

As an aside it is worth noting that at least one author has done research to determine the affect of cold on rimfire ammunition. He tested ammunition at a temperature of eighty degrees, then kept the same ammunition in the refrigerator over night and carried it to the range the next day in a cooler. He reported that velocity was about the same, but his groups were larger and his Standard Deviation (a statistical measure of consistency) was more than double. In this case, at least, performance clearly suffered when the temperature of the ammunition went down. We should probably worry when both our guns and our ammunition gets cold.

Another possible influence on performance derives from the temperature differentials that exist at the Barn. When it is cold there is a contrast between the warm area behind the firing line and the cold air farther down range. And a similar temperature contrast will develop between the inside and the outside of the barn. The net result of all this is that air will tend to move around as the less dense warm air expands or is pushed to displace the more dense cool air. While a number of factors can probably influence the magnitude of these temperature differences (like the actual outside

Continued on next page

The Ghosts At The Tucker Town Barn

Continued

temperature, the time of day, presence of rain or snow, sunshine, the number of people in the Barn, and the size of the fire in the stove), it seems pretty clear that air can move around in this way. The bigger the difference in temperature the more likely it is that air will move if it gets the chance. Exactly how much of this it takes to move a .22 bullet from the ten ring to the nine ring is still a question.

To complicate matters a little more, any large, uninsulated building like the Barn heats up from the top down, particularly on sunny days. The action of the sun on the metal roof creates a "bubble" of warm air that descends as the day progresses resulting in yet another potential tug of war between hot air and cool air. This phenomenon is most apparent in the summer when you need to start shooting before sunrise to avoid the heat. Around 10:00AM you can actually feel a clear difference in temperature by simply standing up.

Whatever the cause, there is always evidence of moving air inside the Tuckertown Barn. It just doesn't blow hard. There are permanent wind indicators there that move. Competitors have used wind flags inside the Barn, and they show air movement. And at one match last year someone set out helium-filled balloons a few feet above the ground all the way down to the targets (which was probably the best idea yet for observing air movement inside the Barn). These balloons indicated movement, although it wasn't what you would see in normal wind conditions outside. Rather, it was a steady but gentle swaying back and forth, like seaweed under water. And even if you dismiss any other influences, we know that on windy days some of that wind finds its way inside. (Closing in the back of the Barn has helped this situation, and the maintenance staff is working hard to plug the small holes that remain.)

Many shooters have believed for a long time that the opening and closing of the door causes flyers. Match Directors, in fact, encourage people to hold the traffic to a minimum, but even if it slows it doesn't ever stop. A lot of people try not to shoot when the door is open, and they like to wait for things to settle down once it's closed. (This belief that the door bothers things has led folks to open and close it quietly and to prevent it from slamming while firing is in progress. This might help some, but it stands to reason that whatever happens when the door is opened is not eliminated by simply holding down the noise. More likely the only difference is that shooters don't know the door opened because they don't hear the usual bump.) Theories about temperature, humidity and the movement of air generally are interesting to talk about. Watching the door, however, is one practical technique that many shooters believe in.

Humidity is a third possible influence on bullets fired in the Tuckertown Barn. Depending on the amount of rain we have the barn can be quite wet, and moisture is held inside rather than dissipating like it would outside. We can't explain here exactly how the humidity level can affect a bullet's flight inside a building, but

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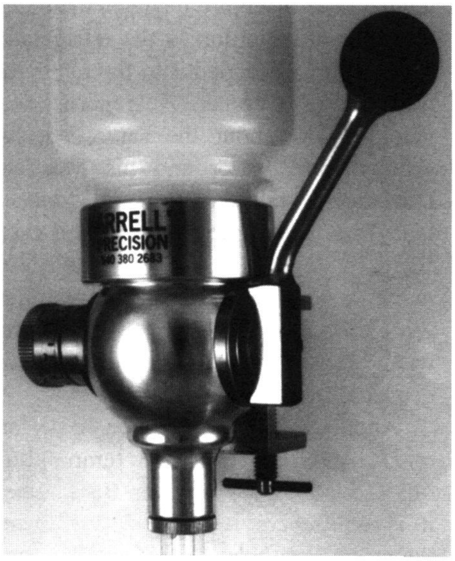

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much has been written on the subject. In fact, a good discussion of this topic can be found in Bob Collins' article "Eley By the Numbers" in the May, 2002 RBA Newsletter. What we can say here is that dry air is more dense and humid air is less dense (all other things being equal), and that there is, accordingly, less drag on a bullet moving through humid air and more drag on one moving through dry air. And the humidity issue is more critical for rimfire shooters since their bullets move at subsonic speeds.

If what we have said to this point is anywhere close to valid, we must also conclude that temperature and humidity overlap to change conditions by creating either more or less drag on rimfire bullets fired in an indoor range. More observation and experimentation are needed to see if this actually works, but just to put it into practical terms think again of the old problem of opening and closing the door. It just may be that the push of air that comes through the open door changes both the humidity and the temperature inside the building (or at least in the immediate area of the firing line), with corresponding differences in the way bullets move from shot to shot. More specifically, it can cause masses of air (humid, dry, warm, cool, or some combination) to move around. And when the door is closed again conditions probably tend to settle down again and slowly return to about what they were before the interruption. Whether this is a major or minor influence will depend on details like the outside temperature, how much it has rained lately, weather conditions, and maybe some other things.

We know from talking with Don Sutton, the Barn's proprietor, that the best rimfire performance there seems to come in the spring and fall of the year. If our logic is correct this would make sense for several reasons. First, it's simply not as cold, and low temperatures alone seem to hamper rimfire performance. Second, it tends to be dryer with a corresponding decrease in the amount of humidity trapped inside the Barn. And third, with more moderate temperatures the differences between conditions inside and outside tend to level out. If our conclusions about the door and other things are correct, there should be less pushing or

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The Ghosts At The Tucker Town Barn

Continued

bumping of one air mass against another. Don also tells us that he has held some centerfire matches in the Barn where some very good scores were turned in. The conditions we are discussing, as noted above, will have much less influence on bullets travelling at supersonic speeds (particularly if they have a better ballistic coefficient) than on subsonic rimfire bullets.

Don contributed one additional observation that should be checked out. His perception, based on years of experience at the Barn in a variety of conditions, is that the benches on the right wall produce better scores than those in the middle and along the left wall. He is quick to point out that he cannot explain why this should be true. If we are correct in our other assumptions, however, it may be that the far right wall, which is farthest from the door, is the spot most distant from the conditions we are trying to describe. In other words, when the door is opened bench eleven is bothered the least. This theory will no doubt be thoroughly tested during the March RBA matches at the Barn.

While it appears the three issues discussed so far, temperature, humidity and the resulting movement of air, are important to understanding how conditions change inside the Barn, there are still some other things to pay attention to. One of these is light. The Barn is essentially a large, dark room, and we shoot from a lighted area through a long dark spot into another lighted area. Some believe that light in this environment is somehow bent or refracted, much like looking at something through water. If this is true the path of the bullet would not change and you might end up aiming at one spot but actually shooting at another. It is interesting to speculate whether the amount of moisture in the air has anything to do with this refraction effect. And it might also account for the effect, observed by some shooters, of sight pictures moving around even though the gun is held steady. When dealing with the question of lighting we should also remember that telescopes tend to magnify whatever conditions are present. Notice how the mirage coming off a barrel looks through a 36 power scope.

Finally, there is still the possibility that conditions inside the Barn do have something to do with all the chickens that have passed that way. Don Sutton recalls that once, before a centerfire match, he had the local VFD come in and water the place down to settle the dust and clean up a bit. The dust got settled well enough, but the ammonia and other exotic agents stirred up were enough to make the place uninhabitable. (Luckily he did this early in the week and the effect wore off by the time of the match on the weekend.) If this is the case, it just may be that the Barn is a unique place to shoot and contains influences found nowhere else.

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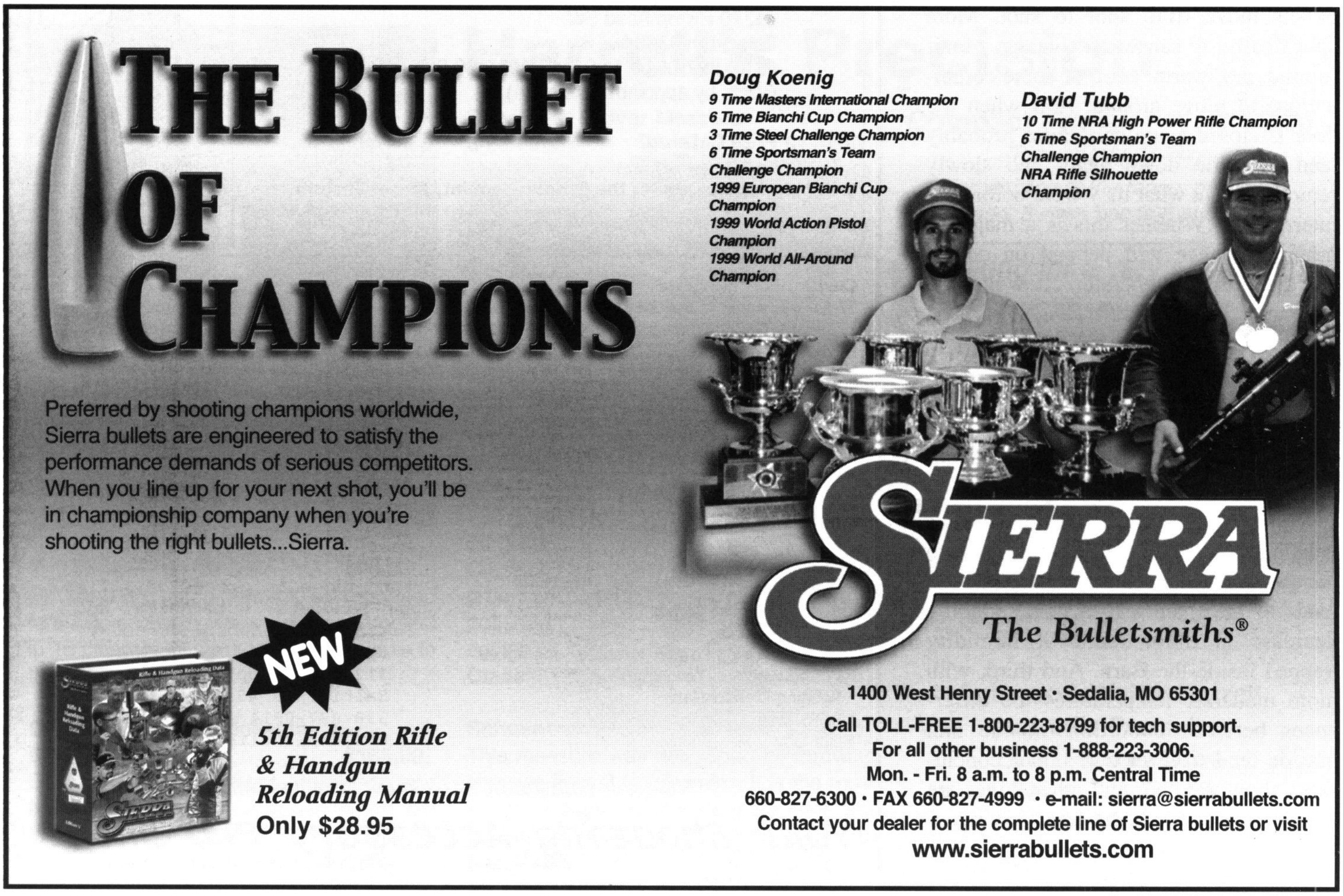

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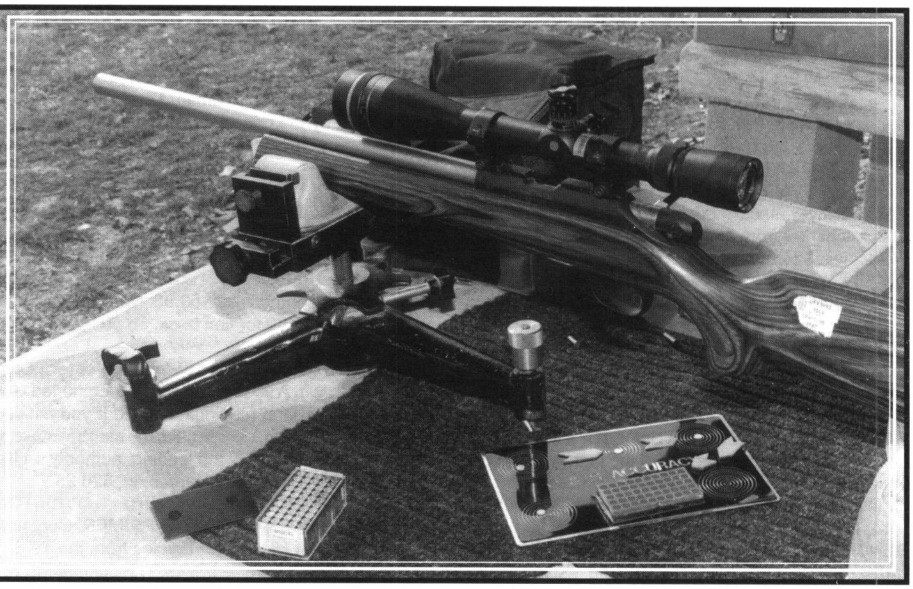
ROD'S WIND MINDER



BY HOKE KERNS

He's only 48 years old so he's not likely to be afflicted with "Senior Moments"—those lapses of memory so common to us old folks—which seem to occur and interfere with our concentration in the middle of a bench rest match. Still, Rod Collins, shooting in situations where he was confronted with multiple wind conditions, found himself having to constantly re-shoot sighters as conditions changed. It was time consuming and ammunition costly. Rod's response to the problem was the development of what he calls the "Wind Minder"—a ready reminder of condition discoveries he makes during a match.

Does it help? Apparently. Has it improved things? It must have. Since Rod, a Montezuma, Georgia contractor, came up with the thing mid 2002 shooting season he has won the RBA Nationals Sporter Class, the Georgia State 50-yard and 50-meter Championships and the South Carolina Sporter record. Seems that it does help.

Rod says during matches where he was confronted with several different changes in wind direction and velocity, where he had to shoot those varying conditions to get all his shots off during the allotted time he would often forget his point of aim for an earlier situation while shooting another. Although it is highly unlikely that he'll be confronted with *five* different conditions during a match his "Wind Minder" provides for recording as many as five conditions. It also has a handy 50-round rimfire ammo supply source—all on a metal plate that's just 5 by 8 inches.

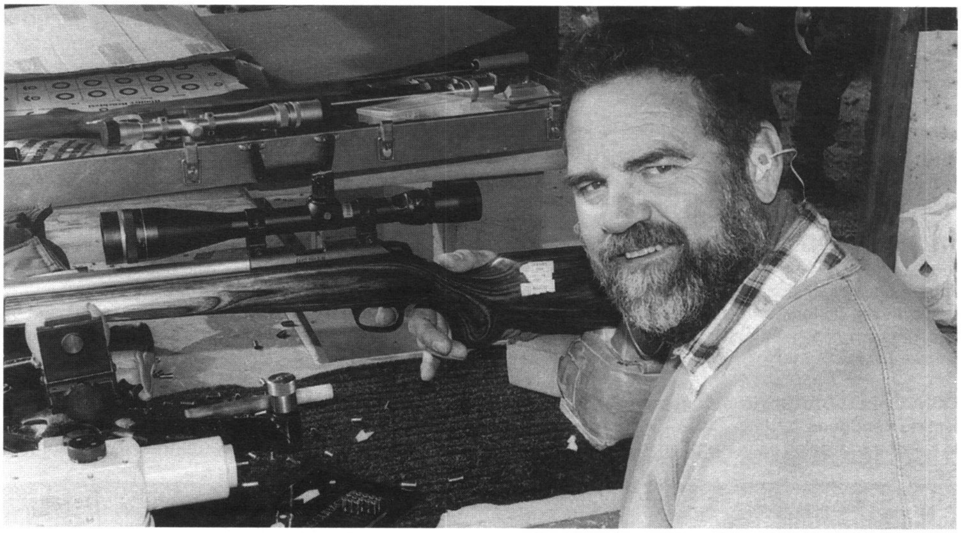
The five "targets" on the plate were engraved from the scan of an IR 50/50 target bull. "Arrows", color coded to the color of the vanes on his wind flags, are positioned to reflect the direction and velocity of the wind. The "arrows" and a small white circle, the size of a rimfire bullet on each bull are magnetized, making their placement and relocation on a bull, as necessary, quite easy.

This is how he uses it. With the prevailing wind coming from 10 o'clock for example, Rod's point of aim is the center of the bull. He shoots three sighter shots at that condition, noting the center of impact of the group. He then places the appropriate colored arrow pointing from 10 o'clock with the point of the arrow at a position on the bull at the same opposite distance from the center as the center of the sighter group, indicating relative wind velocity. The bullet sized white circle is placed where he expects the point of impact to be—somewhere in the "10" ring.

Asked why the white circle is necessary since the intended point of impact is the "X" dot on the target, Rod says with scope adjustments as large as 1/4 moa clicks the placement of the white circle gives him a more precise anticipated point of impact. He can then make minute adjustments in his point of aim as necessary.

As he encounters a change in conditions he repeats that three-shot group exercise and records the results on the next bull with another appropriately colored magnetized arrow and white circle. If there is a third condition, he repeats the exercise again, recording the results on a third bull. Etc.

"Of course, like everyone else, I'd like to be able to shoot just one condition in each match, " he says. "But, it's rare that you have that opportunity and I found that

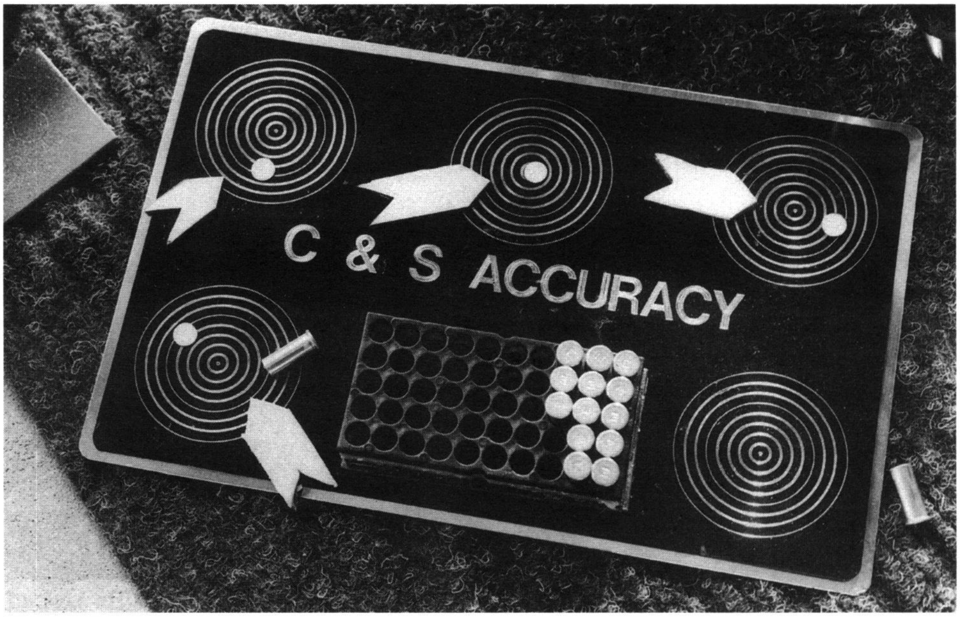


Rod "at work" with the "Wind Minder."

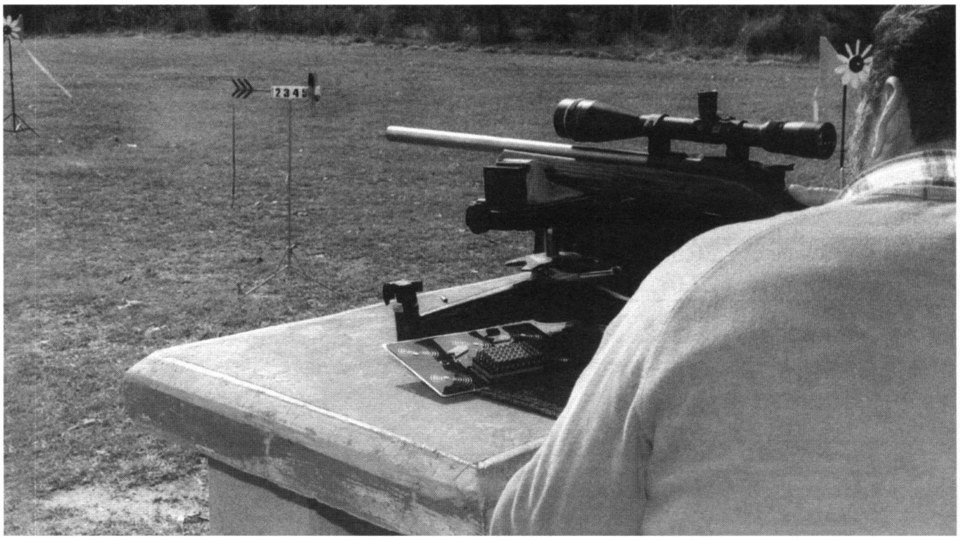
in switchy situations I often forgot just where my exact point of aim was when the winds changed back to a condition I had encountered earlier. I would have to take time to shoot another sighter to make sure I was holding off appropriately. With the "Wind Minder" I just look at the results I recorded earlier, hold my point of aim accordingly and shoot for record," he explains.

He initially had a trophy shop make ten of the metal plates for him. The arrows he produced himself, cutting business card magnets he bought at a discount store to size and shape and then gluing colored foam on them to match the colors on the vanes of his wind flags. The curiosity of other shooters about what he was doing and how he was winning so consistently led him to make them available for purchase through his ammo merchant brother's web site.

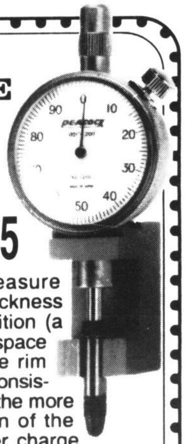
You can get one for $30 plus shipping via the C & S Accuracy web site, http://benchrest.com/csaccuracy, by e-mail to raciii@alltel.net or by telephone at (478) 472-7176.



"Wind Minder" reflecting four different conditions. From l to r on top row: wind from 7:30, low velocity, impact at 6 o'clock on "8" ring; wind from 8 o'clock, medium velocity, impact on the "X"; wind from 9 o'clock, medium velocity, impact at 4 o'clock on "8" ring; (lower (left) wind from 4 o'clock, low velocity, impact at 10 o'clock on "8" ring. If possible, shoot the #2 condition.



"Wind Minder" can record up to five different conditions. Also has a 50-round rimfire ammunition holder on a 5 inch by 8 inch steel plate.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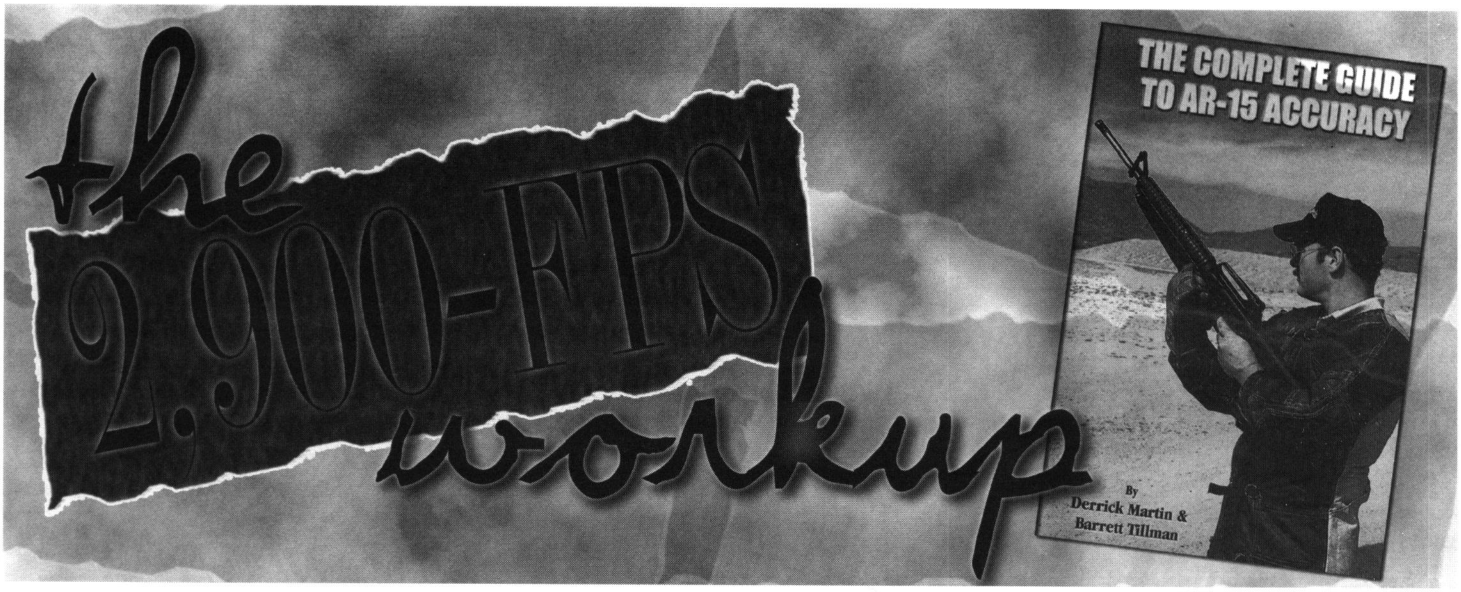
the 2,900-FPS workup


THE COMPLETE GUIDE TO AR-15 ACCURACY
By
Derrick Martin &
Barrett Tillman

BY DERRICK MARTIN AND BARRETT TILLMAN

Burn this article before you read it. The contents approach the realm of heresy—especially for dedicated .30 cal. shooters—and some conclusions may incite .223 enthusiasts to push the envelope of prudence, which we devoutly disavow.

Read on at your own risk.

First, however, some of Uncle Dave's devoted readers may wonder why we'd ever want to drive an 80 at 3,000 foot-seconds. After all, The Book (by whatever title it be known) lists 80s in the 2,700-2,800 fps realm. Well, it so happens that 1,000-yard service rifle shooters are looking for A Better Way to make their AR-15s competitive with the big boys at 56% of a mile. The best way to accomplish that goal is to drive a heavier than normal .223 projectile, at faster than normal velocities. It seems that 80-grainers at 2,700 fps or thereabouts don't do as well as .30 175s or 190s at 1,000 yards. Furthermore, 90-grain JLKs need a 6 1/2 twist tube, a dedicated upper receiver or entire gun, but what do you do if your dedicated upper doesn't like the arrangement?

This year (2002) at Camp Perry the Porter Trophy (1,000-yd service rifle) was won by SPC John Scandale (PANG) with JLK 90s from a 6 1/2 twist barrel. The arrangement soitny woiked for him; nyuk, nyuk...

Analysis time: if velocity is the only requirement for 1,000-yard service rifle contention, how fast does that little BB

Workup Loads (Not recommended loads)

Powder	Load	Velocity	Notes
Acc. 2460	26.0	2,935	
	26.5	2,932	Stuck case, blown primer
H380	28.0	2,805	
	28.5	2,817	
	29.0	—	Chronograph failed
IMR 4064	26.5	2,962	
	27.0	2,967	Full
IMR 4320	27.0	2,983	Primer Smoked
	27.5	3,033	Primer smoked
	28.0	3,063	Primer smoked
	28.5	3,130	Full, case stuck
IMR 4350	26.5	No record	
	27.0	2,535	Full
N150	26.0	2,802	
	26.5	2,844	Full
N550	28.0	2,816	
	28.5	2,951	
	29.0	2,970	Full, Stuck case
R19	27.0	2,421	
	27.5	2,478	
	28.0	2,531	Full
760	28.0	2,702	
	28.5	2,783	
	29.0	2,818	
	29.5	2,868	Stuck case
2520	26.5	2,807	
	27.0	2,871	
2700	27.0	2,557	
	27.5	2,564	
	28.0	2,581	Full

10-Shot Tests

Powder	Load	Avg Vel.	SD	Comments
IMR 4320	26.5	2,879	17	
IMR 4064	26.5	2,924	37	Blown primer
2460	26.0	2,873	46	
2520	27.0	2,871	18	
N150	26.5	2,853	14	
N550	28.5	2,916	21	

need to go?

Therefore, The Question is: will 80-grain .223s tolerate 2,900 fps? More specifically, will they push 3,000 foot seconds and retain their ballistic usefulness? For that matter, will they retain their primers? That's what we set out to learn, and the initial results seem encouraging.

We tested 80-gr Sierras with a dozen or so powders, stepping up half a grain at a time. Test loads were seated to 2 .550 oal, fired through a factory Colt 1-7 barrel mated to a Weatherby Mk V receiver. The long throat and seating depth allowed room for more powder. Ambient temperature was about 45-50 deg. F.

All loads were tested in Lake City primed factory brass.

Here's the data for five-shot pressure tests and the ten-shot checks of the more promising combinations:

Results

We didn't measure the groups, since this wasn't an accuracy test, but none of the groups were bad (2 moa or larger). There-fore, these loads may be regarded as the basis to begin your own experiments or to delete some propellants from consideration.

Two powders provided 2,900-plus fps as the average of ten shots: IMR 4064 and N550. However, the IMR formula resulted in a blown primer with a larger standard deviation than 550. That may or may not be a consideration for your equipment, but keep it in mind. The other four "final test" propellants averaged in the high 2,800s so they're worth a look.

Note that 27-plus grains of IMR 4320 produced some screamin' workup velocities (all the way up to 3,100+) but they were of questionable utility. We consistently found smoked primers, and the full load of 28.5 resulted in a stuck case. Therefore, the ten-shot test load was backed off to 26.5, which came close to 2,900 fps average muzzle velocity.

Remember: this data was obtained under specific conditions with specific equipment; your rifle undoubtedly is somewhat different, and varied results are to be expected. Therefore, it's prudent to back off the ol' powder measure before conducting your own experiments. We can say, however, that launching Sierra 80-grainers at 2,900 fps can be done in our test vehicle.

Proceed prudently. And don't blame anybody but yourself if you blow up a perfectly good AR-15 (even one from Accuracy Speaks) in pursuit of a better 1,000-yd. 223 service rifle.

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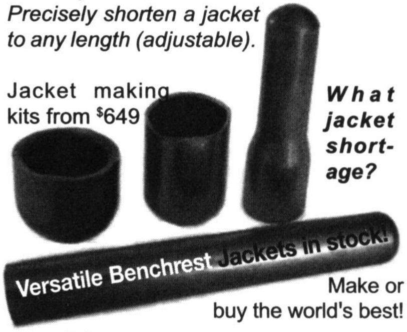

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416 Rem.	45%	60%
375 H & H	55%	70%
338 Win.	54%	69%
300 Wby.	63%	83%
300 Win.	61%	81%
7mm Rem.	63%	78%
30/06 Spr.	54%	69%
270 Win.	57%	72%
6mm Rem.	63%	78%
243 Win.	58%	73%
22/250 Rem.	68%	83%
223 Rem.	67%	82%

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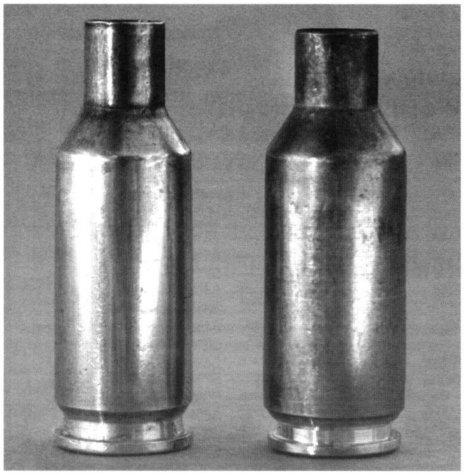
Why You Want A 6BR Match Rifle

BY DERRICK MARTIN AND BARRETT TILLMAN
(Photos by Nyle Leatham)

In the early 90s when Sierra debuted the 6mm 107-grainer, it was shot from a Winchester .243 case. That was the good news. The bad news: barrel life tended to be low (1,200-1,800 rounds) and there were instances of The Mysterious Disappearing Bullet (TMDB). BBs occasionally exploded or vaporized or something. Maybe they were abducted by aliens. In any case, too many projectiles failed to perforate the target.

Gradually it was discovered that keeping velocity below 2,900 fps not only afforded more barrel life, but usually prevented TMDB Syndrome. Those loads, however, left much of the Winchester .243 case empty.

The advantage is that 6mm 107s only use one-third to one-half the wind of 69 to 80-gr .223s. Therefore, 107-grain VLDs seemed promising enough for continued development. Consequently the 6BR looked ideally suited to shoot that 107-grainer at a suitable velocity.



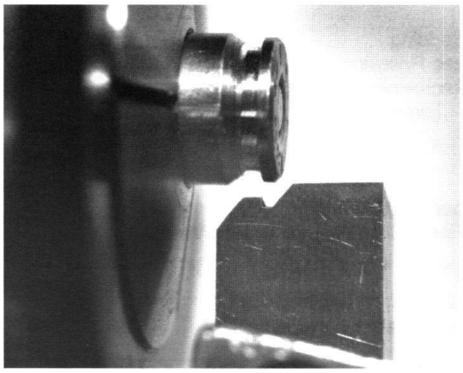
Cases before and after turning.

A 6mm/107 gr. at 2,700 to 2,800 duplicates the wind drift of 6.5mm.08/ .260 Rem. with 142 Sierras. The 6X cartridge (made semifamous by G. David Whatisname, who is still not worthy) based on the .22-250 works in bolt actions but the overall cartridge length is excessive for AR-15 magazines.

On t'other hand, 6BR is too short to function in normal bolt actions, as it doesn't feed or eject reliably due to its length.

For AR-15s, 6BR holds the significant advantage of fitting in an M16 magazine, as opposed to the .223 80s which require single fire. While .223s typically use 24 to 25 grains of powder, 6BR takes more like 29 or 30. It's been used to 1,000 yds with excellent results from the likes of Gary Bartholome, long may he wave.

Some adventurers have reached 3,000 foot-seconds with 107s for 1,000-yd events, but for NRA match rifle our goal is 2,700 to 2,800 in the shorter (26-inch) barrels common to that endeavor. Four inches could make a difference with the bullets and loads we're trying, but if you feel that you really need a 30-inch tube, be our guest.



Turning down the rim with form cutter.

A Rifle is Born

Accuracy Speaks built its first AR-15 6BR for a customer in 1997 or so. It was necessary to solve a number of problems simultaneously, in no particular order:

We started with a Douglas 1 in 8 twist 6mm barrel.

The BR at .473 case head won't fit in an AR-15 bolt, nor can the bolt be opened to accept it. Currently we turn the rims off of BR cases to 6mmPPC/7.62x39 size so that 7.62x39 AR bolts can be used.

Development is underway with Medesha Firearms to make an AR-15 bolt with a .473 (.308 cal.) bolt face.

Using a form cutter in a lathe, we spent a reasonably tedious afternoon turning 500 cases. Maybe three or four hours shop time. It is to be hoped that if enough interest is displayed by the match rifle community (are you paying attention, boys & girls?), a fine organization such as Midway, etc., could be approached to manufacture them in enormous quantity. Presently, however, our hopes lie with a .473 inch bolt. Those who are not into tinkering, tediously or otherwise, can stick with the standard .223 but Really Serious Shooters will seek the path to BR righteousness, attended by less wind.

Since *all* the finest people on this planet are left-handed, we made it a southpaw gun. (Note: yes, we are aware that antigunners such as the past two Presidents of These United States signed the bills restricting our freedoms with their left hands. It is suggested herein that such rare cases only prove the exception to the rule. If you got a problem with that assessment, feel free to vent your concerns to Uncle Dave Brennan. We're too busy loading ammo and shooting rifles to answer the phone.)

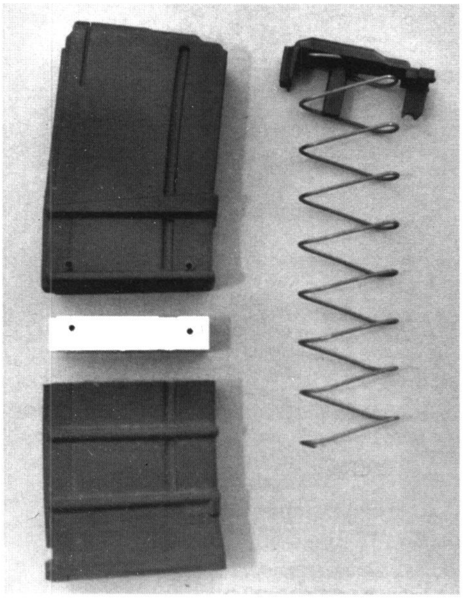
Where were we? Oh, yes. Left-handed rifles. The charging handle is placed on the port side so the shooting hand can manipulate most of whatever needs manipulating. Right-hand ejection wasn't a biggie, as the brass deflector remains mandatory for a lefty AR. Otherwise you get hot brass directly down the side of your neck, which tends to distract even the most disciplined marksmen from insignificant things like sight picture and trigger control.

For the 11% of the humanoids on this planet who are not right-handed, pay attention. With the charging handle on the port side, it's semi-impossible to operate the bolt stop normally, since the charging handle hits the rifleperson's hand on the way forward. Therefore, we recommend operating the bolt stop from the bottom to avoid bruised fingers, broken nails, etc. A right-side bolt release is preferrable, and will be installed on Our Rifle.

The AR-15 6BR uses a vented gas system so that the shootist can tune the gun to his/her ammo for most reliable functioning. Recoil is somewhat more than a .223 but the vented system can be tweaked to adjust bolt speed and thereby reduce felt recoil. Most of what's perceived is cycle energy in bolt speed rather than actual recoil of the cartridge.

Things We Learned Accidentally

With every new concept, the inventor/enthusiast/whatever begins with certain notions. First, the concept surely represents a Good Thing; and secondly, the world is bound to beat down his door in order to get in on it. The third phase, often overlooked at the starting gate, is generally covered by Murphy's Law. In this case, we discovered some things more by accident than design, to wit:



Exploded view of magazine modifications.

Originally we used Remington cases but now lean toward Lapua, though the flash holes are smaller than the US stuff. We know that empirically because the Lapua brass yanks the decapping pin clear th' hell out of the die. It is presumed (lacking further evidence) that the missing pins remained in the case and were propelled somewhere downrange. Danged if we could see any residual evidence...

Lapua brass is lighter than Remington but it doesn't seem that pressure has been a major concern. There's evidence that the unsupported part of the bolt leads to cratered primers, which some folks believe are pressure signs. However, our particular rifle indicates that the unsupported bolt face and firing pin is the cause. The loads that don't work in Remington brass do work with Lapua.

Anyway, a 7.62x39 bolt and extractor were assembled with parts not necessarily from the same supplier. It turned out that a relief cut was too wide, and therefore not flush with the bolt face. This leeway gave the case room to extrude so even moderate loads shaved brass from the rim. Definitely not a Good Thing. We made a plug, silver soldered it in place, and recut to flush with bolt face. Problem solved.

A lesser consideration involved the firing pin and hole in the bolt, which lacked a proper fit leading to primer cratering. Not a biggie, really—just something to be aware of. It's noticeable but not yet a serious concern in the 2,700 to 2,800 fps range.

Speaking of primers: remember that CCI and Winchester offer "military" caps which are thicker than most commercial types, and would reduce cratering. Remingtons seemingly are punctured more than Winchesters *in our test rifle* under the particular circumstances of our tests, but your results may vary.

Our best recommendation would be to use Colt 7.62x39 bolts, extractors, and firing pins. Presumably all are made in the same

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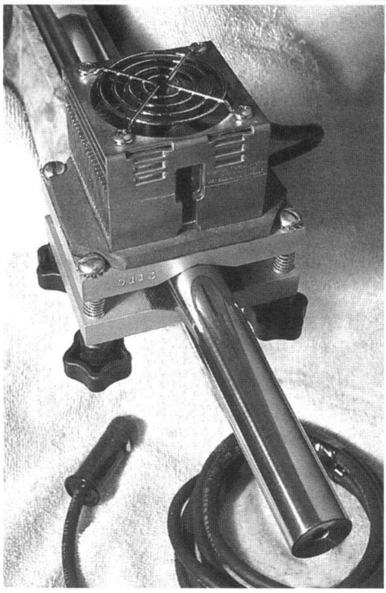

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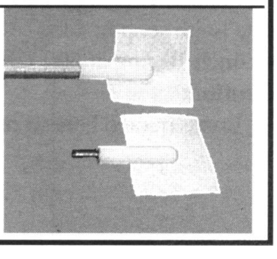

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Why You Want A 6BR Match Rifle

Continued

factory by the same people who would then have been forced to assemble them and see if they actually fit together.

Making Mags

Because of the size of the 6BR cartridge, standard Made-in-the-USA M16 magazines don't work. The interior reinforcing ribs reduce the inside dimension so that cartridges stack almost directly atop one another. This "single stack" arrangement allows them to pop out between the magazine lips. That's the bad news. But never fear. The good news: thanks to an incredible fluke (or maybe the moon was in Saturn—whatever th' hell that means) our good friends North of the Border solved the problem for us and didn't even know it. Or, more precisely, they enabled us to fix our own damn problem.

Canadian Thermold plastic mags are 30-rounders of the type that the femme Defense Minister didn't want issued, lest (gasp!) a Canadihoovian citizen might get ahold of one. However, we cut the mag to the second rib, installed an aluminum base plate and—*viola*! We be in bidness.

As noted, the normal M16 magazine has internal ribs to enhance stacking of the .223 rounds. Not the Thermolds. The 6BR rounds stack wider in the mag, which would ordinarily cause problemos with feeding. The Canadian product has lips slightly closer together than the US variety, so the BR cartridge feeds reliably. It just proves our Accuracy Speaks motto: "We'd rather be lucky than good."

Test Results

Our test samples used Remington cases and Winchester small rifle primers; overall cartridge length is 2.25 in.

The main powder test involved RL-15, an extremely reliable propellant for .223s and similar projectiles. (Besides, we had about 10 pounds sitting on the shelf.) We also tested three others, most of which did not quite match RL's 200-yard performance. However, Varget produced the single best group of the test.

RL-15 started strong at 2,400 to 2,500 fps with consistent subminute groups, then opened up until over 2,600 foot seconds when groups condensed again. Going into the summer competition season, we were using 29 grains of RL-15 in a Remington case with Winchester SR primer to drive a 107 MK at 2,700 fps for the 200 and 300 yard stages. From the 600 yard line we're trusting 30 grains of RL-15 in Lapua brass and Winchester caps to push a 107 at 2,780 fps. Your results may vary, but hey: that's what lazy days and target pullers are for.

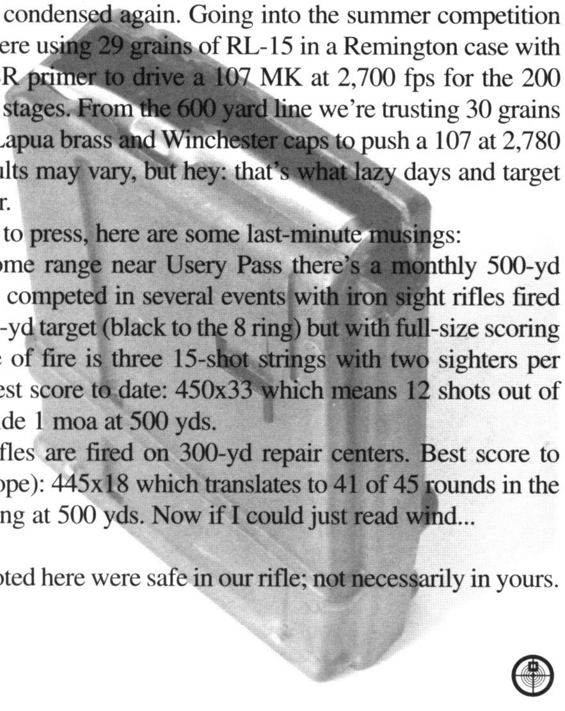
As we go to press, here are some last-minute musings:

At our home range near Usery Pass there's a monthly 500-yd match. We're competed in several events with iron sight rifles fired at the old 600-yd target (black to the 8 ring) but with full-size scoring rings. Course of fire is three 15-shot strings with two sighters per string. The best score to date: 450x33 which means 12 shots out of 45 were outside 1 moa at 500 yds.

Scoped rifles are fired on 300-yd repair centers. Best score to date (with scope): 445x18 which translates to 41 of 45 rounds in the six-inch 10 ring at 500 yds. Now if I could just read wind...

Caution:

Loads quoted here were safe in our rifle; not necessarily in yours.



Grades: -1 moa: A+; 1 moa: A; 1+ moa: A--2 moa: B+; 2 moa: B; 2+ moa: B-

Powder	Load	Av. Velocity	Group	
RL-15	25.5	2,398	A+	
	26.0	2,455	A+	
	26.5	2,495	A+	
	27.0	2,528	B+	
	27.5	2,562	A	
	28.0	2,588	A	
	28.5	2,630	A+	
	29.0	2,690	A+	
	29.5	2,728	A-	
	30.0	2,787	B	Primer crater
	30.5	2,761	A	Failed extraction
	31.0	2,815	A-	Failed extraction
N150	28.0	2,550	A-	
	29.0	2,643	A-	
	30.0	2,729	A-	
N550	28.0	2,354	A-	
	29.0	2,461	A	
	30.0	2,581	B+	
Varget	28.0	2,645	B	
	29.0	2,701	A+	Best load tested
	30.0	2,795	B+	

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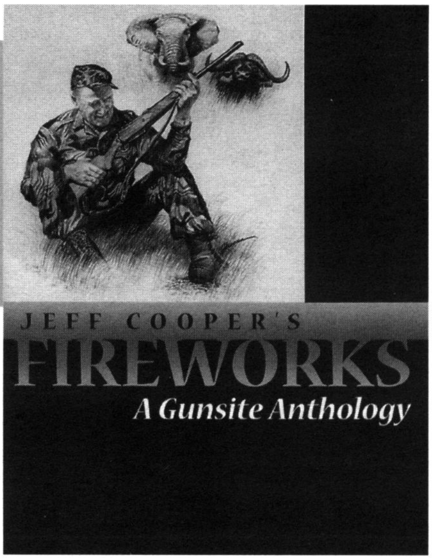

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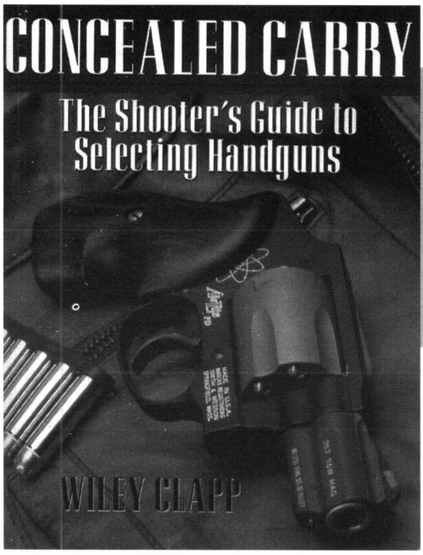

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Exclusive Interview With Rock McMillan

McMillan High Power and Hunting Rifles

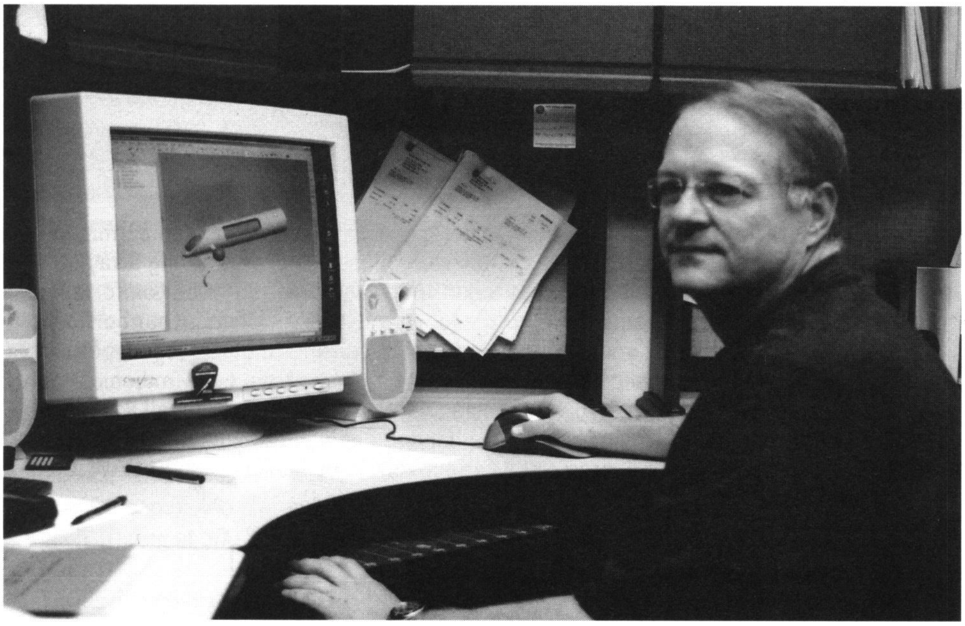
McMILLAN FIBERGLASS STOCKS

McMILLAN FIBERGLASS STOCKS

BY ROBERT H. BOATMAN

Ask most gun people to describe a McMillan rifle and they're likely to conjure up a big 50-caliber military sniper rifle. But that image reflects neither the roots of the company nor the best-selling products it produces today. The late Gale McMillan, founder of the company, was a benchrest pioneer. His son Rock, who now runs the rifle company, numbers considerably more target shooters and hunters among his customers than colonels and commanders.

"My father was involved in the new sport of distance shooting starting in the 1950s," says Rock McMillan as he swivels away from the three-dimensional diagram of a precision turnbolt rifle action on his computer and speaks to me across his desk. "As that shooting discipline grew, he grew with it. My father came up with a lot of innovative ideas on how to improve rifle accuracy. Our synthetic rifle stocks are a big deal, you won't find many target rifles today built on anything but a synthetic stock, and we started building them in 1973. Little things like glued-in bedding, my dad was one of the first to glue an action into a stock. Short barrels, when I first started shooting benchrest everybody had 26-inch barrels on their guns. My dad had a barrel he built that was too short to sell, so he put it on a gun, called it "stubby," went to a match and won and people realized you don't have to have long barrels to shoot well. I think my dad was the first one to explore a lot of things like that.



Rock McMillan, shown here in his office, says his father, Gale McMillan "had to build his own guns because he was too poor to pay anybody else to do it. He built his own benchrest rifle and won the California State Benchrest Championships in 1960."

"He was a gunsmith. From the time I was little I remember my dad had a hobby shop building guns, he would build guns for friends and guns for himself. He had to build his own guns because he was too poor to pay anybody else to do it. So that's how he learned. That goes all the way back to the '50s. He built his own benchrest rifle and won the California State Benchrest Championships in 1960.

"It wasn't until the early '70s that we started making fiberglass stocks. We used wood stocks all the way up until 1972, and I can tell you honestly that our first experience with a fiberglass stock was one of Chet Brown's stocks. Very early in the program my dad bought two of Chet Brown's stocks to build a gun for one of the guys he worked with. We looked at Chet's stocks and said, This is nice but we think we can do things better if we do it a little differently, so we started building our own stocks. We were too stupid to know what we couldn't do. We started building our own stocks and we were pretty proud of ourselves that, at the end of the first year, we had sold 120 rifle stocks. We look at that stuff and compare it with what we sell today and there's no comparison."

Today, the rifle company and stock company are separate. Rock runs the rifle company and his brother Kelly runs the stock company.

It was the reputation McMillan had established for accuracy and precision in their benchrest rifles that called them to the attention of the military in the late 1970s.

"We developed a very close relationship with Naval Special Forces," Rock explains. "We built guns for them, they were happy with them, we did special projects for them, we had a very good close relationship. In the early '80s, maybe '83 or '84, they expressed an interest in having a 50-caliber rifle. The Barrett M82 came out in '82, a 50-caliber semiauto, but the Navy wanted something that was more precise. They didn't want an autoloader, they wanted a bolt gun. We built the gun that eventually became the Navy's M88. It went into service in 1988 and stayed in service until about two or three years ago, at which time they replaced it with the M88pip, a repeater 50-caliber bolt gun. We build all the major components, the actions, the stocks, and they do the assembly. They call it the M88pip—"pip" for Product Improvement Program, we actually engrave them "pip"—and that's what the Navy uses today."

It was not the military McMillans I wanted to talk about in this interview, but the sporting McMillans, the ones firing projectiles designed to punch clean holes in distant paper targets or knock down big game trophies rather than disable enemy radar installations, and it was not at all difficult to persuade Rock to discuss what, in normal times, is the clear majority of his company's business.

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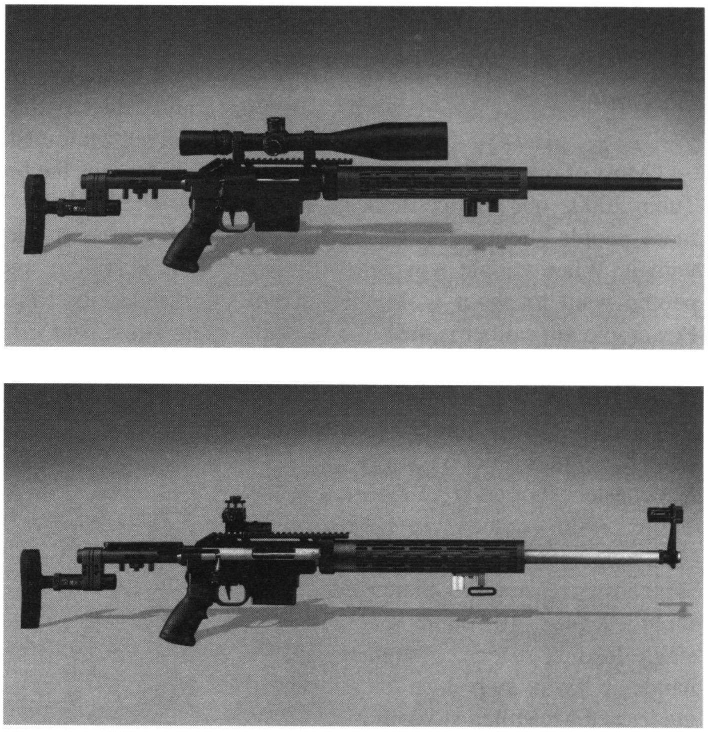

The Tubb 2000 is popular in NRA High Power matches and is available in both competition and tactical configurations. McMillan says, "We've known for years that the essential elements in rifle design and construction were shared in common between competition and tactical rifles."

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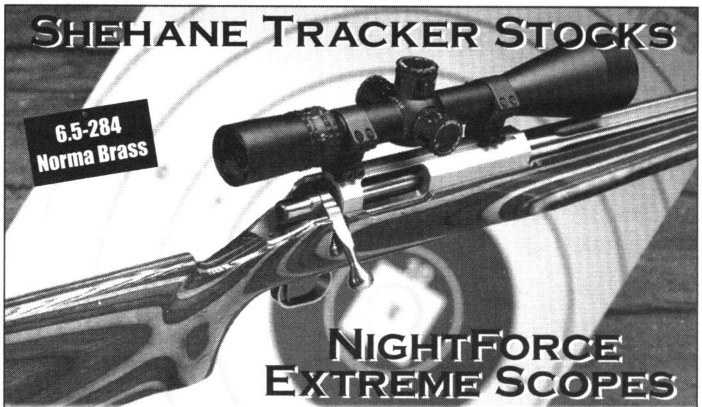

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McMillan High Power and Hunting Rifles

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"Most of our business right now is the Tubb 2000, our competition guns. As more people shoot it, more people win with it. When people win with it, other people want to shoot it. In NRA High Power, the hot caliber is the 6mmX. I still remember when the benchrest caliber of choice was the .222 Remington."

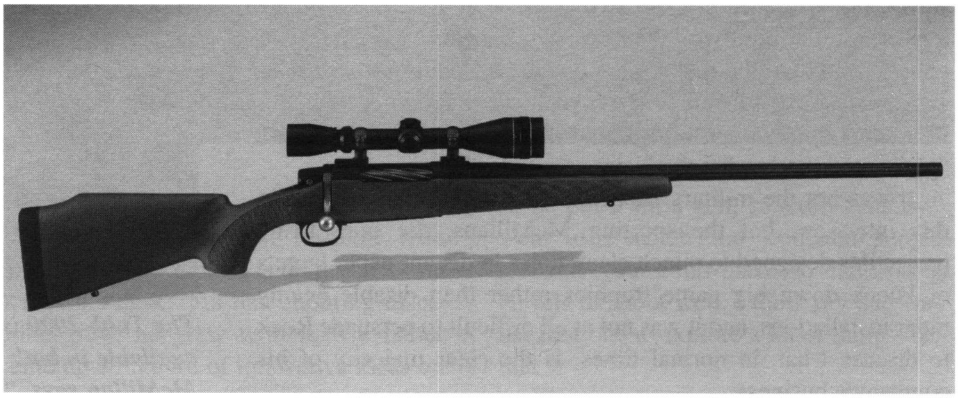
Besides the highly competitive 6mmX, which is basically a .243 Winchester shortened .130 inches, the Tubb 2000 comes in .243, .260 Remington (6mm-08), 7mm-08 and .308 Winchester. From the factory, the rifle includes four 10-round magazines, a single-loading device, custom adjustable handstop with swivel, a cleaning rod guide, and McMillan stock in a choice of seven colors. Also available is the Tubb Contour Schneider custom stainless steel match barrel with action wrench, completely finished and ready for customer installation.

According to McMillan, the goal of the Tubb 2000 was to develop and engineer an extremely accurate precision-built centerfire rifle that was completely adjustable to the individual shooter—to deliver state-of-the-art competitiveness right out of the box.

The Tubb 2000 also comes in a tactical configuration (tactical is 2000t, competition is 2000c), available in .308 only, and includes one 10-round magazine, a barrel-mounted cant indicator, a buttplate pinch block, sling swivels and a cleaning rod guide. This rifle is intended as an uncompromising tactical weapon for professional law enforcement and military special operations use.

McMillan says, "We've known for years that the essential elements in rifle design and construction were shared in common between competition and tactical rifles. The Tubb 2000 is rugged, reliable, adaptable and, beyond all else, accurate."

Both competition and tactical versions of the Tubb 2000 feature a "switch barrel" configuration for easy barrel replacement by the customer and a "no bedding"



Among McMillan customers are some of the most passionate hunters in the world, and the company builds hunting rifles accordingly. Rock McMillan says, "We will always build and sell hunting rifles."

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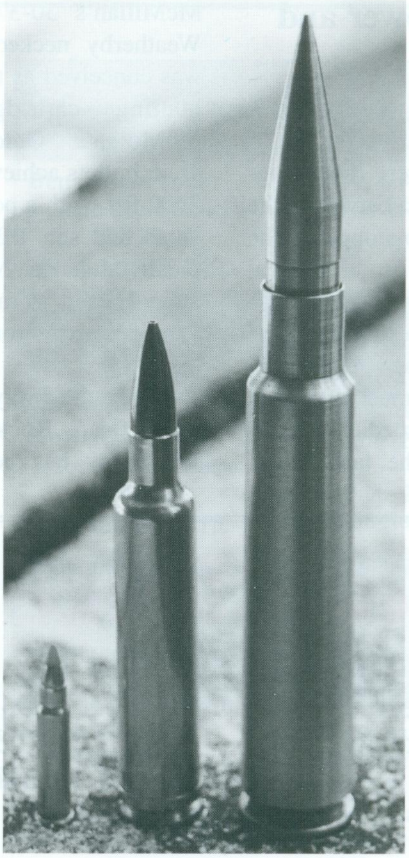
design that eliminates zero shifts from disassembly. The right-handed guns have an Anschutz fully adjustable two-stage match trigger with safety, which can also be adjusted to provide single-stage operation, while the left-handed guns utilize a Jewell trigger. The 25-inch hand-lapped Schneider barrels are contoured for minimum weight consistent with optimum accuracy, and feature short-throat chambering for maximum life. The action is machined from 17-4 stainless steel to benchrest quality standards, with 8620 carbon steel machined bolt featuring a short 75-degree lift and low-effort operation.

Rock McMillan says, "From a tactical standpoint, the Tubb 2000t offers all kinds of advantages. From a competitive standpoint, Tubb 2000c shooters are winning matches. Our sales right now are probably fifty-fifty between the tactical and competition configurations."

Rock admits that he is not the most passionate of hunters, though he does take to the field from time to time. But among McMillan customers are some of the most passionate hunters in the world, and the company builds hunting rifles accordingly.

Barrels for McMillan hunting rifles are match-grade stainless steel. Actions are stainless steel manufactured completely in-house to aerospace standards, with features like a Sako-style extractor, thumb-lever bolt release and Remington-style trigger and safety. Stocks are, of course, McMillan fiberglass, pillar-bedded and with Pach-mayr decelerator recoil pads. Metal finish is a corrosion-resistant matte black polymer.

Calibers available range from .22/250 to .458 Winchester Magnum, with perhaps the most interesting and certainly one of



The 30-378 Weatherby was conceived as the ultimate long-range hunting cartridge. Chambered in McMillan's "Outdoorsman" rifle, 180-grain bullets achieve a muzzle velocity of 3600 fps, with a point-blank range of 500 yards and sub 1/2 MOA accuracy. McMillan says, "We have many satisfied customers who have taken elk at 700-800 yards with one shot." Shown here between a 17 HMR and an Ackley Improved 50 BMG.

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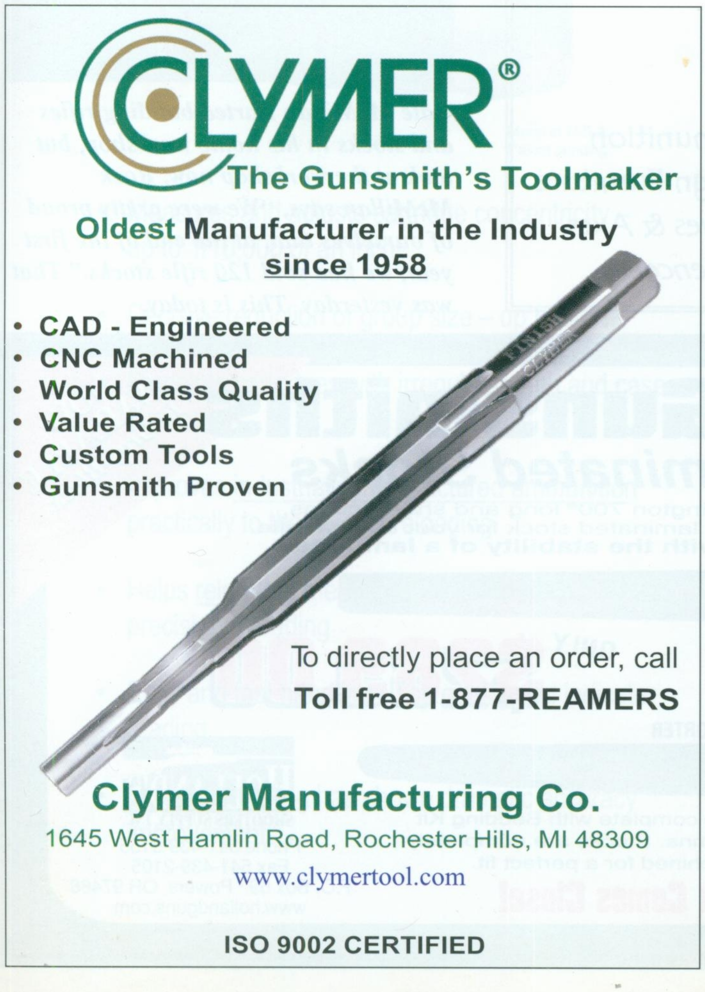

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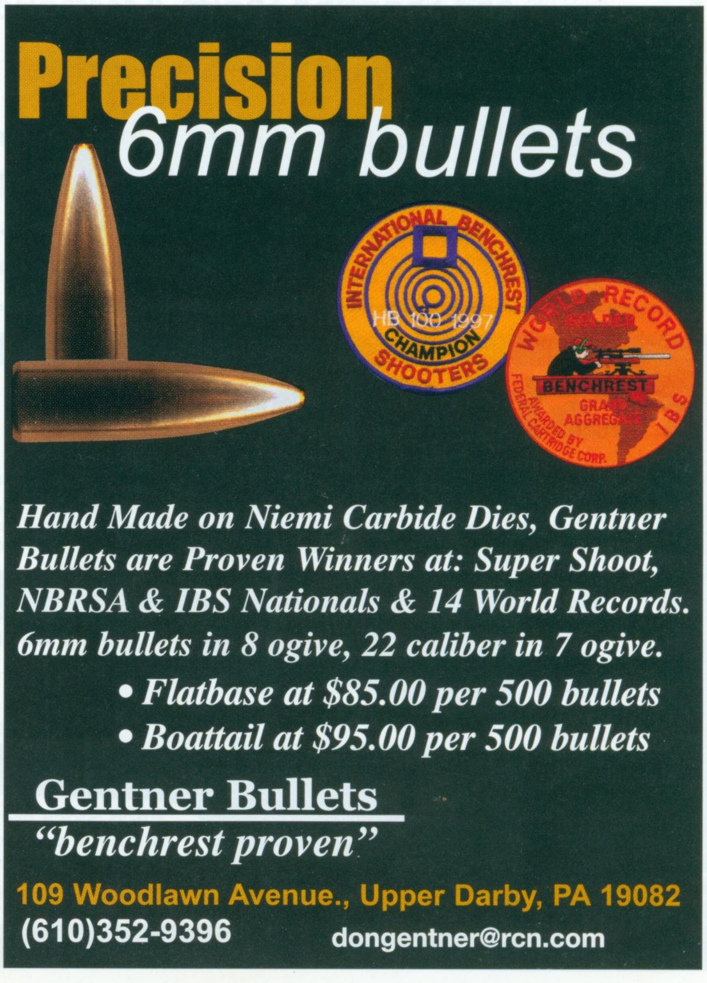

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McMillan High Power and Hunting Rifles

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the most popular being a very robust big-game wildcat that falls between the varminters and the buffalo-stoppers. The 30-378 was developed as a wildcat cartridge by Roy Weatherby in 1959 at the request of the United States Army. "The world's fastest 30-caliber cartridge" remained a wildcat for almost 40 years, until Weatherby finally introcduced it as a production cartridge in the late 1990s. McMillan's 30-378 Weatherby, a .378 Weatherby necked down to 30-caliber, was conceived as the ultimate long-range hunting cartridge. Chambered in McMillan's "Outdoorsman" rifle, 180-grain bullets achieve a muzzle velocity of 3600 fps, with a point-blank range of 500 yards and sub 1/2 MOA accuracy. This means that no North American game animal, even at ranges well beyond 500 yards, is safe from a decisive one-shot kill.

"We will always build and sell hunting rifles," Rock says. "The 30-378 Weatherby has been a very successful gun. Trophy hunters all over the world like it because it shoots lightweight bullets really fast, it shoots nice and flat. We have many satisfied customers who have taken elk at 700-800 yards with one shot. The 30-378 guns all come with muzzle brakes, so it's manageable, though it's not something you'd take on a prairie dog hunt. We always have several orders in-house at any one time. Of

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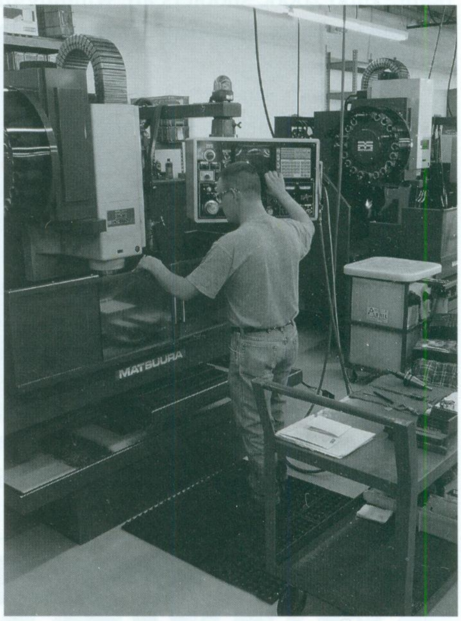

Gale McMillan started building rifles and stocks in his home workshop, but look at the workshop now. Rock McMillan says, "We were pretty proud of ourselves that, at the end of the first year, we had sold 120 rifle stocks." That was yesterday. This is today.

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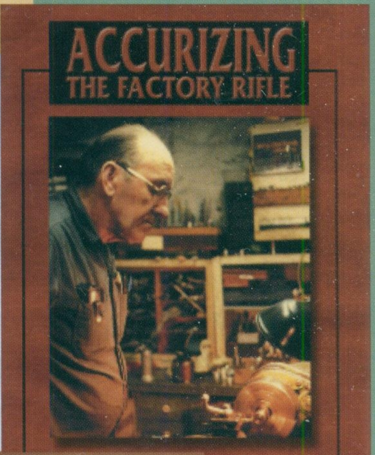
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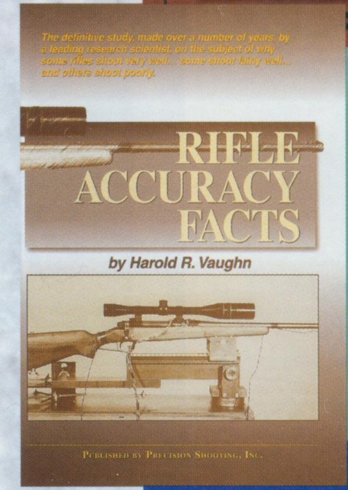
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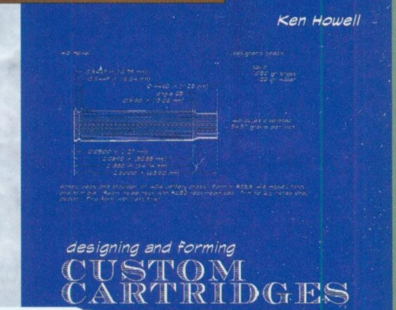
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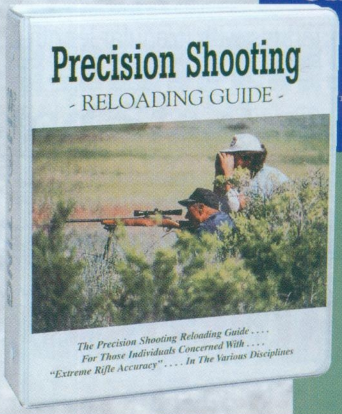
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McMillan High Power and Hunting Rifles

Continued from page 80

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Robert H. Boatman is the author of *Living with Glocks* (Paladin Press 2002). Signed first editions of the book are available at www.livingwithglocks.com. Contact the author at interboat@aol.com.

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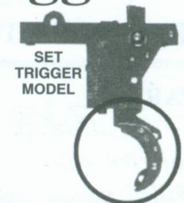

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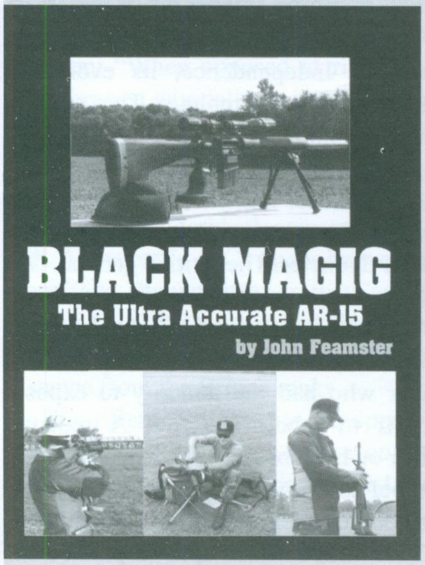

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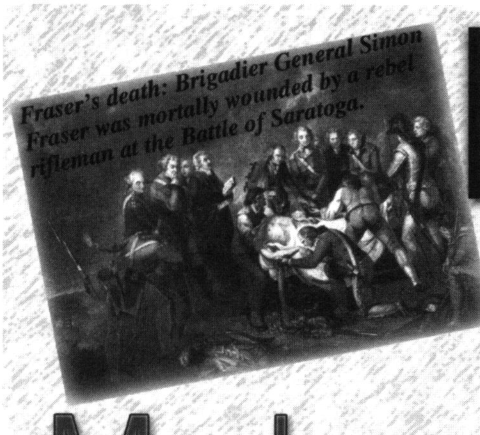


Fraser's death: Brigadier General Simon Fraser was mortally wounded by a rebel rifleman at the Battle of Saratoga.

Looong SHOTS with LONGRIFLES– Marksmanship or MYTH?

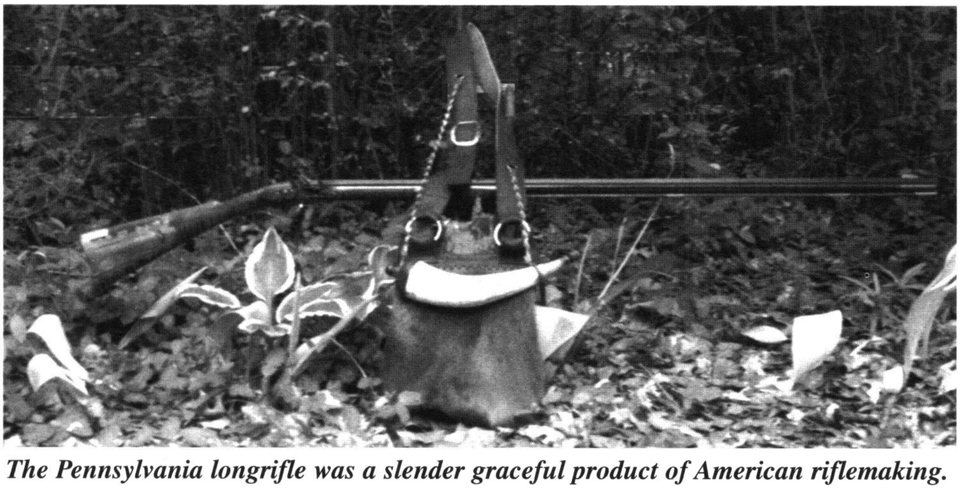
BY FRED STUTZENBERGER

PART 1:

"Of all weapons, the long, soft-metal-barreled rifle is the most dangerous in skilled hands, though it wants a strong arm, a quick eye, and great judgment in charging to put forth all its beauties." (Hawkeye, in "The Last of the Mohicans" by James Fenimore Cooper).

Those of us whose childhood predated television grew up on a literary diet of legendary figures who could drive tacks with their trusty longrifles at amazing distances. The modern movie version of *The Last of the Mohicans* widened the gap between the longrifle and reality when Hawkeye picked off three denizens of the dark using three different longrifles at ranges that would make a cruise missile cringe.

The short heavy Jaeger rifle was the precursor of the American Pennsylvania longrifle.



The Pennsylvania longrifle was a slender graceful product of American riflemaking.

The flintlock longrifle originated in Pennsylvania among immigrant gunsmiths who received their early training in the European guild system. By the mid-1700's, the traditional Prussian *Jaeger* hunting rifle was undergoing a transition in America to a 50% longer barrel and a 50% smaller bullet mass.

By the beginning of the War for American Independence, its evolution was essentially complete. The classic Pennsylvania flintlock longrifle (commonly called the Kentucky rifle) sported a barrel that stretched up to four feet and threw a round ball about half-inch in diameter. The British general, Sir William Howe, referred to the longrifles as "the terrible guns of the rebels", and indeed they were terrible to any British officer who had the temerity to expose himself to rebel rifle fire. A redcoat officer on horseback within a quarter mile of rebel sharpshooters was well advised to be on good terms with his Maker.

This last point was aptly impressed on the British major, George Hanger, when he personally observed the skill of a rebel sharpshooter who killed the horse of his bugler on a windstill August day *"Now speaking of the rifleman's shooting, nothing could be better. I have passed several times over this ground and have observed it with the greatest attention,* *and I can positively assert that the distance he fired from at us was full 400 yards."*

The highest-ranking British officer to fall before the longrifle was Brigadier General Simon Fraser. In the battle of Saratoga, Colonel Daniel Morgan directed several of his riflemen to concentrate their fire on the general at a distance of about 350 yards.

Almost immediately, bullets came clipping the tack and mane of the general's iron-gray horse. Admonished by his aides to retire to a safer position, the general replied: "My duty forbids me to fly from danger." Within seconds, a rifle ball pierced his stomach just below the breastbone and lodged in his spine. He was buried the next evening. General Fraser had made his fatal choice between concealing concern for his personal safety in the presence of his men and the human tendency for self-preservation.

Fraser was not the only officer to fall at Saratoga that day. One British officer remembered that his colleagues "fell like pheasants", leaving some units without a single commissioned officer by the end of the day. The slaughter of their officers took the heart out of the British troops, and the entire force of 6,000 surrendered on Oct. 17, 1777. Years later, Captain Henry Beaufoy reflected on the dilemma faced by General Fraser and other British officers selected as targets for the rebel riflemen: "When opposed to riflemen, it is the bravest who fall, for it is the bravest who expose themselves most, and thus become the most conspicuous".

Morgan's riflemen were not always deployed as individual snipers firing at will. At the battle of Cowpens between the Broad and Pacolet rivers in the Carolinas on Jan. 17, 1781, Morgan had his riflemen out front of the militia at about 200 yards distance from the British ranks.

His riflemen were not equipped or trained to withstand a close-quarters bayonet charge, so he commanded them to repeatedly fire and retreat. When Lt. Col. Banastre Tarleton impetuously hurled his cavalry forward to dislodge the skirmishers, the charge was broken up before it had hardly begun as the dashing green-coated Dragoons tumbled from their saddles under accurate rifle fire.

Within an hour, Tarleton had lost 90% of his cavalry, most of his subordinate officers and his own horse. The rebel riflemen eventually retreated to comparative safety behind the muskets and bayonets of their militia. They had used the greater range of their rifles to punish the British advance while the militia in the rear held their smoothbore musket fire. The longrifle had given the victory to the rebels.

Perhaps the most courageous and innovative British officer to fall under rifle fire was Major Patrick Ferguson at the Battle of King's Mountain in upcountry South Carolina on Oct. 7, 1780. His Provincial Rangers and Loyalist Militia were largely armed with the regulation Brown Bess musket (Ironically, Ferguson had invented a rapid-firing breechloading rifle, and had impressively demonstrated it before the British ordnance board; despite its excellent performance, the conservative British bureaucrats clung to the smoothbore Brown Bess musket). The British were opposed by a numerically equivalent force of "Over the Mountain Boys" who carried their personal longrifles from the Sycamore Shoals on the Watauga River in east Tennessee. At King's Mountain, the wooded terrain favored the rebels who employed accurate rifle fire against selected British targets, who in turn could not mount effective massed musket fire and bayonet charges through the thick undergrowth. Seeing that the battle was lost, Ferguson led a gallant charge on horseback down the mountain side and fell with 7 rifle balls in his body.

Continued on page 87

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Looong Shots with Longrifles Part 1: Marksmanship or Myth? *Continued from page 85*

This American victory was the first step in a two-year campaign that led to General Cornwallis' surrender at Yorktown.

While the longrifle was obviously superior in long range performance to the smoothbore musket of its day, over the years, fable tends to outrun fact. It's just human nature to record and enshrine accomplishments that are pleasant to recall (i.e., the lucky shot or the winning group). And surely a British officer toppling from his horse at Saratoga, King's Mountain or Cowpens would have erased the frustrating memory of a string of previous misses in a rebel's mind. In an effort to discern marksmanship from myth, the next article of this series will include tests on the performance of representative Pennsylvania/Kentucky rifles out to 400 yards, a distance considered to be their extreme historical and practical range (national NMLRA competition in flintlock round ball matches is usually limited to 100 yards). That information will be used to derive an educated estimate of how closely an 18th Century rifleman had to estimate distances to compensate for the severe ballistic limitations of his weapon.

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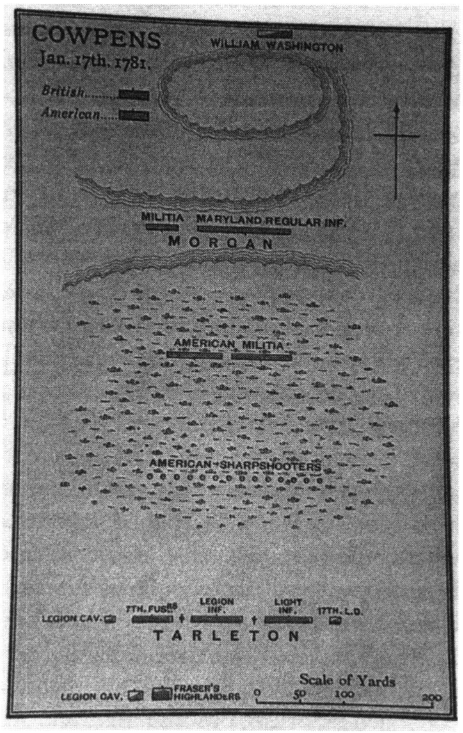
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Jan. 17th. 1781.
British
American
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MARYLAND REGULAR INF.
MORGAN
AMERICAN MILITIA
AMERICAN SHARPSHOOTERS
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TARLETON
LEGION CAV.
FRASER'S HIGHLANDERS
Scale of Yards
0
50
100
200

Map of the Battle of Cowpens, 1781.

Acknowledgements

Thanks to John Cummings, Tom Harbin and Lois Sill for their valuable assistance in the research and writing of this manuscript.

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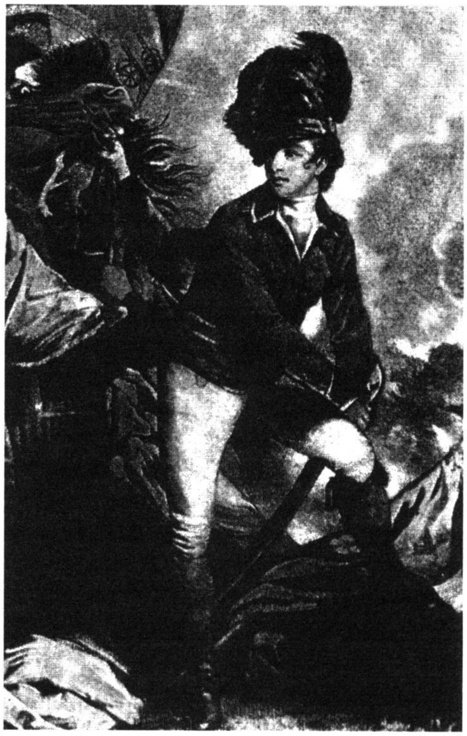
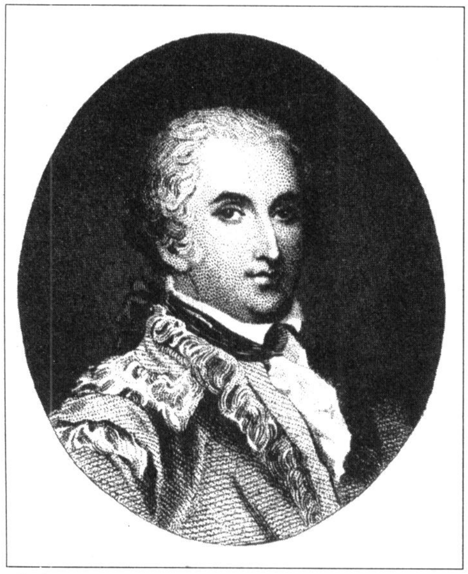
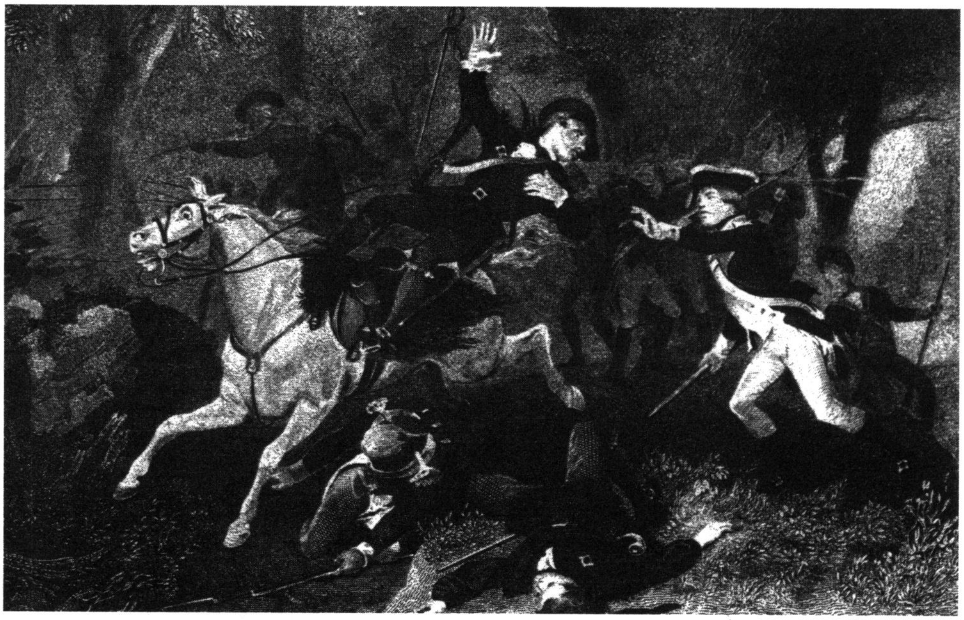


Lt. Col. Banastre Tarleton was a bit of a dandy and a ruthless commander.



Col. Daniel Morgan, commander of the Virginia riflemen during the American Revolution.



The death of Maj. Patrick Ferguson.

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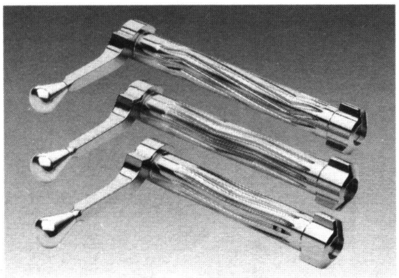

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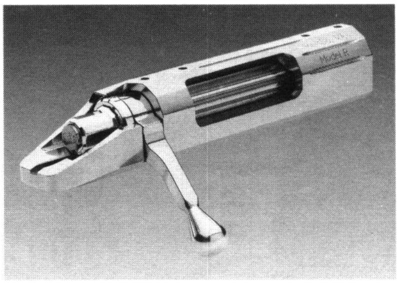

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Looong Shots with Longrifles – Part 2: Marksmanship or Myth?

Continued from page 87

PART 2:

"Provided an American rifleman were to get a perfect aim at 300 yards at me standing still, he most undoubtedly would hit me..." Major George Hanger, King's Fusileers, 1780.

The first part of this series described the use of the Pennsylvania flintlock longrifle (Kentucky rifle) in the hands of rebel sharpshooters during the American Revolution. Although battles of the day were traditionally fought by massed fire from smoothbore muskets between the opposing ranks, there were several instances (notably Saratoga, Cowpens, Guilford Courthouse and King's Mountain) where accurate rifle fire on selected targets gave the victory to the Americans. The usual directive to the riflemen, in Col. Andrew Pickens' words at Cowpens, was "Shoot the epaulets and stripes", i.e. kill the officers and sergeants. This article describes some results from testing flintlock rifles, comparable to those of that period, in an effort to determine how proficient an 18th Century sharpshooter had to be in judging distance to hit man-sized targets up to 400 yards away.

There was no uniformity of caliber, barrel length or rifling among the handmade Pennsylvania rifles. A typical rifle would have a bore diameter of .40 to .54 inches; an average for surviving Revolutionary Period rifles appears to be about .47, although many were re-cut or "freshed out" periodically as the soft iron wore. This practice increased the bore size considerably over many years of hard use and could be misleading as to the original caliber. Rifling varied from four to twelve lands-and-grooves (seven was most common) with a nominal pitch of 1:48 to 1:72 inches. For the purposes of the tests described here, two custom modern-made muzzleloading rifles were chosen. A .40 caliber Andrew Verner style flintlock that threw a .389 ball (88 grains) from a 43 inch barrel with a rifling pitch of 1:48 inches (six lands-and-grooves) was chosen to represent the lower end of the caliber range. The other was a Lancaster style .50 caliber flintlock that threw a .495 ball (180 grains) from a 44 inch barrel with a rifling pitch of 1:66 (seven lands-and-grooves).

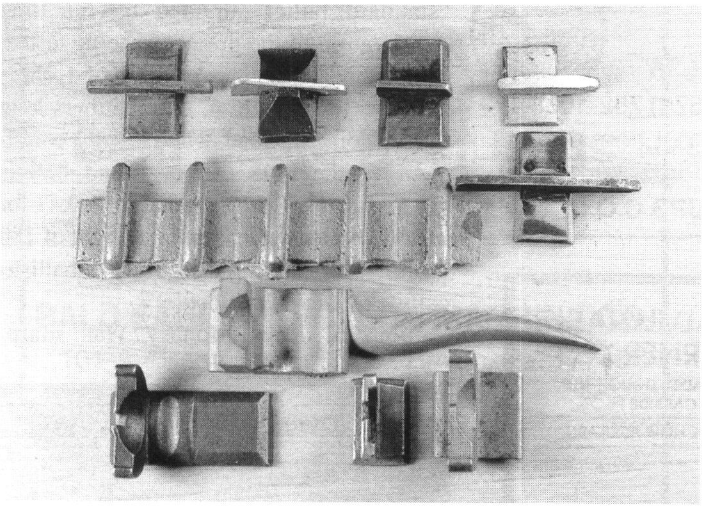

Fig. 1. The traditional sights for Pennsylvania longrifles were simple, fixed notch and blade combinations that were relatively impervious to damage during hard use.

Each 18th Century backwoods sharpshooter developed what he thought was the best load for his specific rifle. One method of determining the standard powder charge was to lay the round ball in the flattened palm of the hand, then slowly pour powder over the ball until it was just covered. When this method was applied by the author to the .495 caliber round ball, five successive charges ranged from 52 to 70 (average of 60) grains of FFg black

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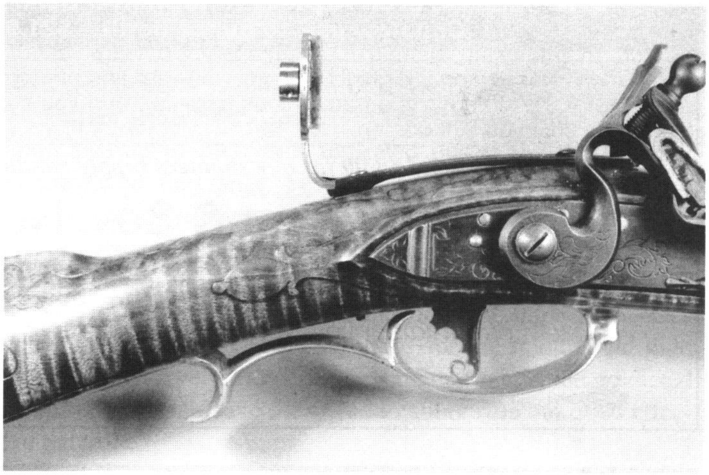

Fig. 2. Temporary aperture tang sight made by the author.

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Looong Shots with Longrifles Part 2: Marksmanship or Myth? *Continued*

powder (it would be hard to imagine the variation outside on a windy day!). Another old axiom was to carry into the field four bullet-weight of powder for every ten balls (72 grains of powder for each .495 ball). A formula devised by the author for best grouping precision (see references) was to multiply the ball diameter by the rate of twist and double the product. For the .495 ball fired from a barrel rifled one turn in 66", that figured out to 65 grains. A compromise between velocity and accuracy was chosen as 70 grains FFg Goex black powder. A similar method was used to establish a load of 43 grains of FFFg black powder for the smaller caliber Verner rifle.

The longrifle was traditionally loaded with a round ball surrounded by a greased cloth (cotton or linen) patch to act as a gas seal in the rifling grooves. Ballistic coefficients for various shapes of projectiles can be calculated as the drag deceleration of a "standard bullet" divided by the drag deceleration of the projectile being tested. The "standard bullet" is flat-based, three calibers long with a two calibers-long ogive (pointed) head. The ballistic coefficient of the .495 caliber round ball is approximately 0.070 compared to 0.41 for a 30-06 bullet with a similar weight of 180 grains. The round ball is truly a ballistically-challenged projectile.

For the Revolutionary War sharp-

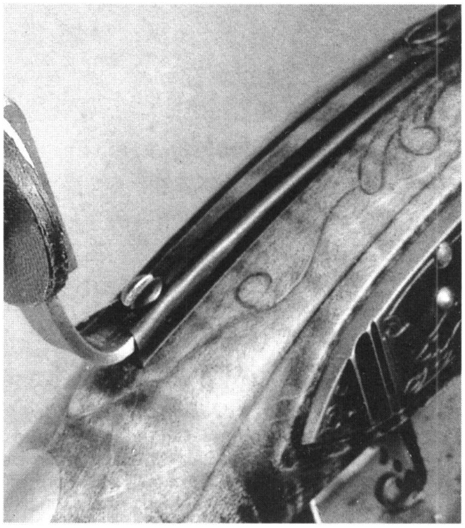

Fig. 3. The large disk was added to the aperture sight to minimize distraction during sighting.

shooter, the difficulty in compensating for the poor ballistic characteristics of round lead balls was compounded by the paucity of adjustable sights with reproducible settings. Although adjustable sights (both open multi-leaf and aperture) had been used in Europe for many years, such sights were rarely seen on the American longrifle. Although many examples of Revolutionary War era flintlocks have survived, less than one in two hundred show evidence of any original equipment sight other than a low, fixed-blade front coupled with a simple notched rear sight. A collection of period-type front and rear sights is shown in Fig. 1.

Although aperture sights were unusual on the American longrifle, they were not unheard of. Many years ago, I was fortunate enough to view a large collection of southern mountain rifles in eastern Tennessee. Most southern mountain rifles had unusually long breech tangs, sometimes stretching back over the whole length of the wrist. One rifle had a hand-forged tang-mounted aperture sight with three holes spaced vertically about an eighth inch apart. Obviously, the three holes were meant for sighting at various distances, but I was puzzled as to why the holes were so large (approximately a quarter inch in diameter). On closer inspection, I observed that they were threaded, indicating that they were meant to receive a threaded eyepiece that had apparently parted company with the rifle.

In an effort to reproduce the performance of this type sight, I put together a similar sight, using materials (a piece of 14 gauge mild steel) and tools (drill bits, threading taps and dies) that would have been available to the average gunsmith of the late 1700's. Although the sight was somewhat flimsy compared to my memory of the sturdy old original, it would serve its purpose if carefully used at the range. The sight was mounted on the flintlock rifles via two screws through the tang.

This rifle had been sighted for fifty yards with its open sights. The aperture sight was bent to align the holes (according to my calculations) so as to elevate the point of impact 2, 16 and 30 inches for the lowest, middle and highest hole, respectively. After some preliminary testing, a round disk was added to shade the eye and eliminate distraction from the other two holes.

This type of sight would have given the sharpshooter three advantages over that of the open sight. The most obvious is the 50% increase in the sighting radius from 30 to 45 inches. Second, the rifleman would not have to focus on the rear sight, but merely look through its aperture. And third, in looking through the aperture, the eye is able to sharpen its image via the pinhole camera effect (an effect that increases in importance as the eye ages and the macula degenerates). Even at 50 yards, the improvement in group size using aperture sights was marked.

The poor ballistic characteristics of the round ball created a rainbow trajectory that required experienced handling of the rifle and a highly accurate estimate of range in order to hit a man-sized target. Tests of the smaller caliber rifle for bullet drop and group size up to 200 yards indicated that if the sharpshooter miscalculated the range by 25%, he also missed his target (assuming that the average man of his day was 5'6" tall).

The adjustable aperture sight as described earlier could compensate for the rainbow trajectory effect depicted in Fig. 5; moving up the aperture shifted the point of impact to –15.5 inches and +31.0 inches at 200 yards for the middle and high settings, respectively. However, beyond that range, the predicted group spread would take the smaller caliber rifle out of its effective range.

The larger of the two rifles was sighted initially for 150 yards and tested at various ranges out to 400 yards. While it cut a

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Looong Shots with Longrifles Part 3: Marksmanship or Myth? *Continued*

relatively small group of four inches center to center at 200 yards, it did not offer much of an advantage in terms of trajectory at the greater distances.

During these tests, my shooting companion brought along his 6BR varmint rifle to the range. As a comparison to be run under the same range conditions, I asked him to shoot a few groups at the various distances over which the muzzleloaders were being tested. The drop and group size of the 6BR is shown in Fig. 7.

At 400 yards, the bullet drop and group size of the 6BR would have allowed a sniper to consistently make body hits without adjusting sights. Even at 800 yards, my companion was able to keep his groups within a 10-inch circle.

On the other hand, the rainbow trajectory of the round ball was a severe and demanding taskmaster; that would have been the major dilemma for the Revolutionary rifleman. If he had his .50 caliber rifle zeroed at 100 yards (which would surely be a reasonable maximum for woodland hunting), the ball would have dropped about 32 inches on a target at 200. With the fixed open sights of that day, a target out at 400 yards would have required an aiming point anywhere from 20 to 30 feet above it, depending on the ball weight and powder charge. On the other hand, if the rifle were sighted to hit point of aim at 400 yards, the mid-path error would place the ball about 10 feet high at 200 yards. An error of +/- 3 feet would have caused a miss on a man of even large stature for those days. Therefore, misjudging the distance by only a few yards would let the target escape untouched (although perhaps a bit rattled by the near miss of the ball). In the third and final part of this series, the author will enlist the aid of experienced marksmen to determine how difficult it would have been for the 18th Century

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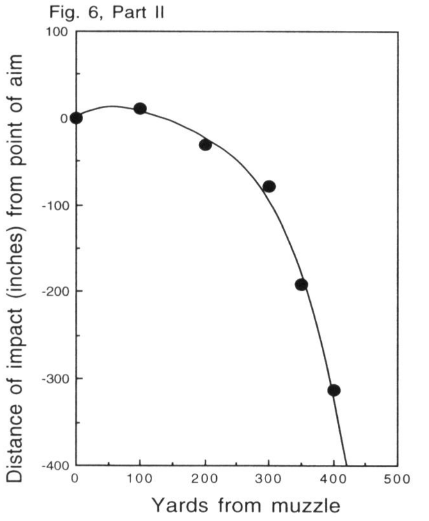
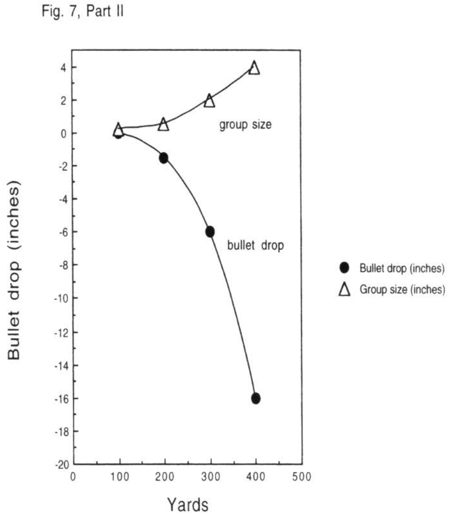


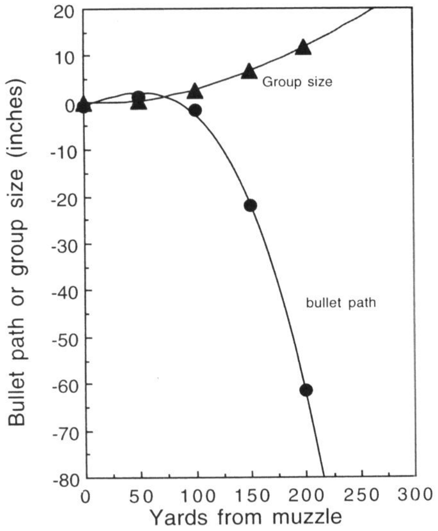
Bullet drop for the .495 ball. Plot was fitted by a 4th degree polynomial equation with a correlation coefficient of 0.992

Fig. 6. Bullet drop for a .495 ball over a range of 400 yards. The plot was fitted to the data via a 4th degree polynomial equation. The correlation coefficient was 0.992.



Bullet drop and group size for 6BR at ranges up to 400 yards

Fig. 7. A good marksman with a modern rifle like the 6BR would not have to make sight adjustments to hit a man-sized target at ranges from 100 to 400 yards.



Effect of distance on bullet drop and group size for .389 round ball. Plots were fitted via 3rd degree polynomial equations

Fig. 5. Effect of distance on bullet drop and group size for the .389 round ball. The plots were fitted to the data via 3rd degree polynomial equations. The correlation coefficient for either plot exceeded 0.99 (1.000 indicates a perfect correlation).

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Looong Shots with Longrifles Part 3: Marksmanship or Myth?

Continued from page 92

rifleman to estimate the distances required for hits with the round ball flintlock rifle.

Acknowledgements

The author thanks John Cummings and Tom Harbin for assistance and advice during these tests.

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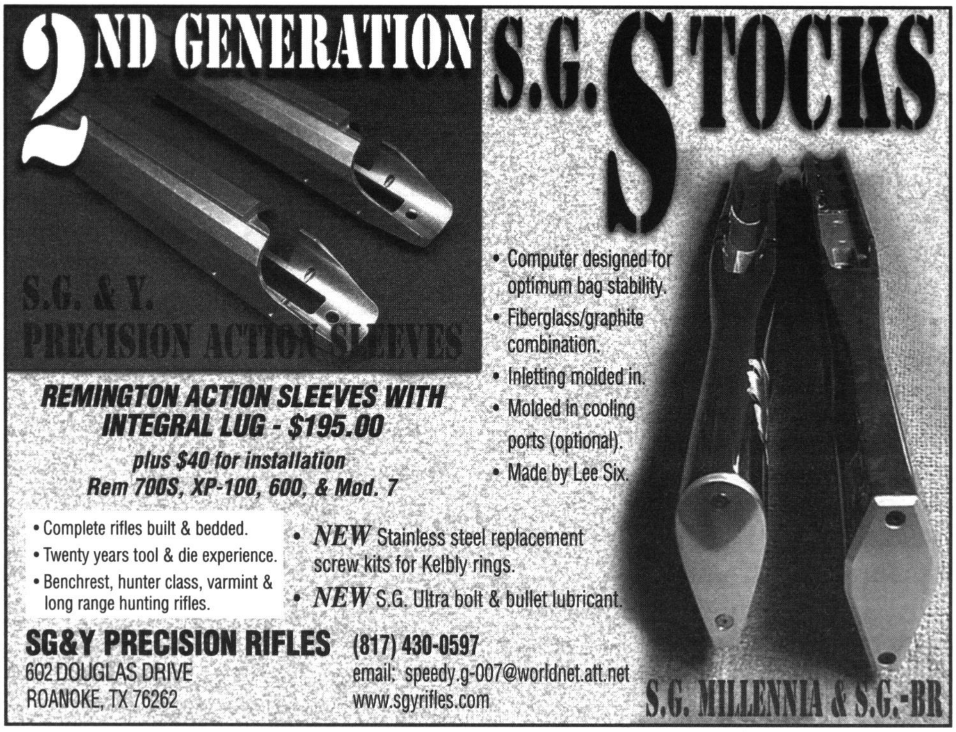

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PART 3:

"Incorrect range estimation is the biggest cause of long-range misses; more so than bad wind estimation, more so than jerking a trigger, more so than a poor hold or lead, more so than inaccurately computing up/down compensation." J.L. Plaster, from *The Ultimate Sniper.*

The previous articles in this series have described some long range sharpshooting feats of rebel riflemen in the American Revolution, and the results of trajectory tests using Pennsylvania/ Kentucky rifles similar to those of that day. In several battles between 1777 and 1782, British officers faced the long range precision of backwoods volunteers who picked off individual targets out to 400 yards with frightening regularity. Sir William Howe, the commander of British forces in North America, referred to the longrifles as "the terrible guns of the rebels". Although they were the most accurate firearm of the day, the trajectory of the round lead ball was so curved that it required precise estimation of distances to be effective. The 18th Century American rifleman had no precise technology with which to calculate distance to the target. He did, however, have his "rule of thumb" by which he extended his hand so that the edge of his upturned thumbnail aligned at the bottom of the target. A British officer walking along the ranks of his men prior to a charge was a perfect subject. If the officer

Fig. 1 . Five MPH wind deflection of a .495 ball fired with a muzzle velocity of 1700 feet/sec

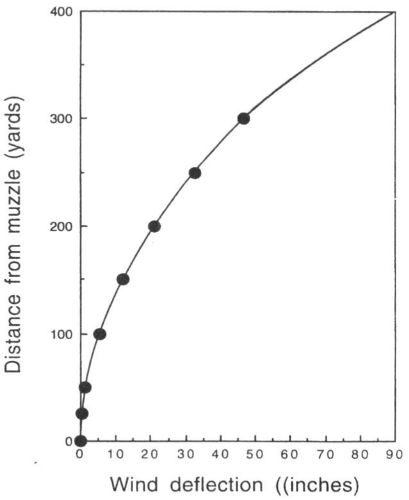

Fig. 1. Drift of a .495 round ball under the influence of a 5 MPH cross-wind. Extrapolation to 400 yards was done via a 3rd degree polynomial equation fitted to the data of Almgren and McDonald (see references).

took four paces to traverse the width of the rifleman's thumbnail, the estimated distance was 200 yards, three paces and the range was 150 yards, two paces and the range was only 100 yards. For a mounted officer, if the length of his horse standing broadside stretched half the width of the nail, the distance was 300 yards.

While the thumbnail method may seem very imprecise, it had several advantages in eliminating deception in apparent distance caused by the intervening terrain. A target will generally appear closer if viewed across a canyon or hollow or from higher ground. On the other hand, it will appear further if viewed from lower ground or through a narrow corridor between trees. The raised thumbnail blocked out the irregularities of terrain and provided an immutable, if imprecise, scale of reference. Interest-ingly, many original Kentucky rifle rear sights were the identical width of an average man's thumbnail (0.70-0.75"). Perhaps the rifleman let his intended victim walk across the top of his rifle's rear sight before he adjusted his aim and squeezed the trigger.

In contrast to the 18th Century American rifleman, the modern marksman has a variety of optical and electronic devices for the accurate measurement of distances out to half a mile and beyond. This article describes research in which laser range finders were used to determine the ability of experienced marksmen to estimate distances; each estimate was then graded as to whether it would have generated a hit on a man-sized target at extreme muzzle-loading rifle ranges.

To gauge the degree of difficulty in judging long distances over flat ground, two colleagues were asked to estimate distances out to ~600 yards. One colleague was a former Marine sniper, the other is currently a rifle team coach. We took turns as two-man teams estimating distances to man-sized objects across flat terrain; the author also made several estimates on his own. A few estimates were made on larger objects such as small trees and outbuildings to evaluate the influence of size on the judgment. Each

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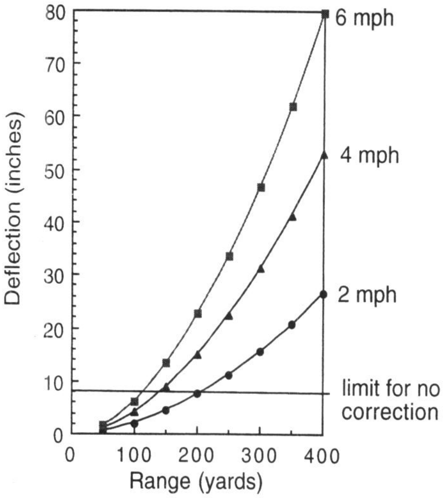

Bullet deflection (inches) by 90 degree crosswinds of 2, 4 and 6 mph

Fig. 2. Round ball deflection by crosswinds of 2, 4 and 6 mph. Horizontal line across the graph shows the limit of no correction (maximum distance at which a man-sized target with a cross-section of 18" could be hit without compensating for the wind drift).

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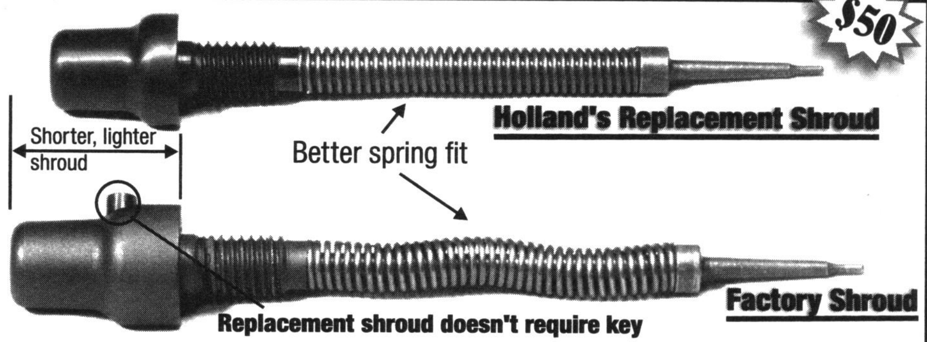
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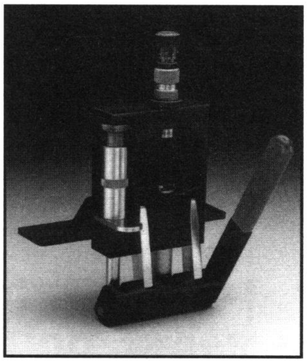

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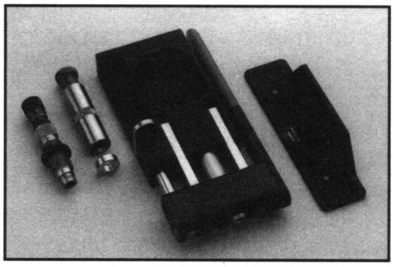

The Accurate Rifle

The Accurate Rifle
November 2000
Vol. 3
No. 10
$3.95

From the staff of ***Precision Shooting*** magazine... whose masthead motto declares "Dealing exclusively with extreme rifle accuracy"... comes a second publication, focused on the same general topic as its widely respected parent. ***The Accurate Rifle*** will leave coverage of organized, competitive shooting (Benchrest, highpower, smallbore, 1,000 yard, etc.) to its parent publication. All other areas of rifle coverage that are found in the pages of the unique and singular ***Precision Shooting*** will also be found in ***The Accurate Rifle***: rifle testing (both factory and custom rifles)... scopes evaluation... accuracy gunsmithing... do it yourself modifications... practical field shooting... tactical rifles evaluation... accuracy handloading... varmint shooting... custom actions... match grade barrels... custom triggers... match quality bullets... accuracy history and nostalgia. It's all here, with the same droll humor and self deprecating philosophy that have long been a trademark at **PS**. The staff writers at ***Precision Shooting*** and the former ***Tactical Shooter*** (now re-focused and renamed ***The Accurate Rifle***) are among the most respected writers today in the firearms journalism field.

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Looong Shots with Longrifles Part 3: Marksmanship or Myth? *Continued from page 95*

estimate was recorded without telling his partner so as not to bias his estimates. Then the distance was electronically measured using Bushnell Yardage Pro 400 or Compact 800 Yardage Pro range finders. The errors by the three distance estimators were recorded as plus or minus yards from the actual distance measured by the range finders. The significance of each error on bullet placement was determined via Ballistic Software provided by Mr. Bill Frenchu (Version 4.13, 1988-94). The assumptions were: (a) the theoretical human target was 6 feet tall (a generous estimate for 18th Century men), (b), the aiming point was at the vertical mid-point of the target, and (c), a distance estimate that resulted in a bullet placement vertical error of 3 feet above or below the target mid-point would constitute a miss. For example, if the estimated distance was

Continued on next page

Table 1. Visual distance estimates compared to laser instrumental measurements of distances over flat ground.

Measured distance (yd)	Estimator 1	Estimator 2	Estimator 3
78		70 (+)	85 (+)
83		90 (+)	
114		110 (+)	160 (+)
119	110 (+)	104 (+)	
138	130 (+)	144 (+)	
151	150 (+)	127 (+)	
152	160 (+)	135 (+)	
172	170 (+)	180 (+)	
188		200 (+)	
202	150 (+)	176 (+)	
203		220 (+)	
220		210 (+)	150 (+)
224	230 (+)	245 (+)	
232		190 (+)	195 (+)
248		280 (+)	185 (-)
265		370 (-)	265 (+)
276		310 (+)	270 (+)
279	250 (+)	420 (-)	
288		210 (-)	290 (+)
292		300 (+)	276 (+)
296		370 (-)	191 (-)
302		305 (+)**	280 (+)**
304		300 (+)	260 (-)
340		260 (+)	310 (-)
356	380 (-)	400 (-)	
362	340 (-)	425 (-)	
386		390 (-)	340 (-)
424		365 (-)	
451		450 (+)*	465 (+)*
498		420 (-)	460 (-)
505		400 (-)	420 (-)
542		430 (-)	530 (+)
648		510 (-)	590 (-)
Percent "hits"	80%	64%	57%

*indicates distance estimated over water **indicates distance estimated over intervening water and land

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Looong Shots with Longrifles Part 3: Marksmanship or Myth? *Continued*

340 yards and the actual measured distance was 386, the ball would have hit about 9 feet below the target and would have constituted a miss (discounting ricochets). The results are shown in Table 1. Estimates that would have produced a hit (assuming proper sight compensation, trigger pull and negligible wind effect) are marked with a (+), misses with a (-).

From the results of these tests, the following conclusions were evident: at distances up to about 250 yards, visual range estimation was quite adequate to allow consistent hits on man-sized targets.

At distances of 250-300 yards, our estimates would have yielded hits about two out of three shots. Targets at 350 yards and beyond would have sustained hits only about one in five shots based on the accuracy of our judgment. Therefore, the rationale behind Morgan's placement of his riflemen at 200-250 yards from the British lines becomes evident—the riflemen could have made consistent hits on selected targets (preferably officers) while his British counterpart would have little chance with his smoothbore musket of hitting the widely dispersed enemy riflemen.

The above requirements for sharpshooting success were made under the conditions of the perfect world. If they weren't complicated enough to perplex the muzzleloading sharpshooter, introducing a light wind would be. Consider a steady 5 MPH wind, the kind that can be felt on the face and that causes the leaves to barely rustle. Out at 400 yards, the rifleman would have to compensate for a >7 foot wind drift as predicted by the data of Almgren and McDonald. (Fig. 1.)

Considering the marked effect of a crosswind, the next question to be answered would be, what would be the maximum distance that a hit on a man-sized object could be made with no compensation for the wind? The 18th Century rifleman had no wind gauge other than his own estimate of its velocity gained from visual and tactile perceptions. The ballistic software was used to predict bullet deflection at wind speeds of 2, 4 and 6 mph; plots of this effect are shown in Fig. 2.

Based on these theoretical values, the rebel rifleman could hit his man-sized target at 210 yards without correcting for a 2 mph cross wind; this "no correction" distance would shorten to 140 yards with a 4 mph wind and to 120 yards with a 6 mph wind.

However, from a practical standpoint, an experienced rifleman familiar with long range shooting in windy conditions can do a great deal in compensating for this huge horizontal drift. Therefore, a practical test was conducted to determine the effects of crosswind on grouping precision by an experienced muzzleloading marksman. I enlisted the aid of a close friend who had spent 40 years matching wits with the winds of west Texas. A room full of trophies attests to his success in competition in an environment where heat mirage and strong winds are a fact of life. He was asked to fire a 10-shot group from a rest at 200 yards using the heaviest load (85 gr of FFFg powder, muzzle velocity of 1,840 fps) commensurate with tightest grouping in a custom .50 caliber round ball rifle. Using aperture sights in the summer heat with a measured cross wind of five MPH with gusts to 8-10 MPH, bullet drop was ~28 inches between 100 and 200 yards; this value compared closely with the ~31 inch drop predicted by the Ballistic Software for a round ball with an initial muzzle velocity of 1700 fps. Groups measured ~4.5" horizontally by 1.9" vertically at 100 yards, and widened to 10.75" horizontally by 8.8" vertically at 200.

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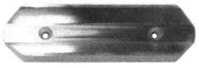

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Under those crosswind conditions, he estimated that at 300 yards, he would be able to hit a man-sized target with about 50% of his shots. At 400 yards, he said it would be anybody's guess under those dusty, gusty conditions.

British Major Hanger was well aware of the seemingly uncanny ability of rebel sharpshooters to closely estimate distances, but was also aware of the complications introduced by the wind, *"Provided an American rifleman were to get a perfect aim at 300 yards at me standing still, he most undoubtedly would hit me unless it was a very windy day"*. The movement of regimental colors and pennants in the vicinity of the British officers may have offered the sharpshooter some information as to how much to compensate for wind drift, but they would not have offered a high enough aiming point to compensate for the huge drop of the round ball at those long distances. Therefore, the rebel rifleman must have developed an uncanny ability to closely estimate distances and elevate the muzzle of his rifle accordingly if he were to be successful as a sniper against selected human targets. No records were kept of the rebels' success rate at long range—surely, the British officers who were being targeted harbored a grim and grudging respect for their abilities in an era when everything else colonial was denigrated by the Crown.

Although the text of the Revolutionary War battle history was written by the massed fire of the smoothbore musket, it was punctuated by the accurate fire of the long rifle. While severely limited by its rainbow trajectory, the longrifle must have created a distracting psychology in its targeted enemy by the knowledge that he was singled out for destruction. Granted that the mathematical probability of being struck by a single aimed longrifle ball at 400 yards was pretty low (probably not greater than one in ten), the dread of anticipation must have weighed on the mind of every British officer facing the backwoods rebels. Captain Beaufoy summarized that effect: "It has readily been confessed to the writer by old soldiers, that when they understood they were opposed by riflemen, they felt a degree of terror never experienced by general action, that a rifleman always singled out an individual who was almost certain of being killed or wounded." While that degree of certainty was severely tempered by the limitations of the flintlock longrifle, the fear it wrought in the mind of many a targeted man surely magnified it to near absolute inevitability.

Acknowledgments

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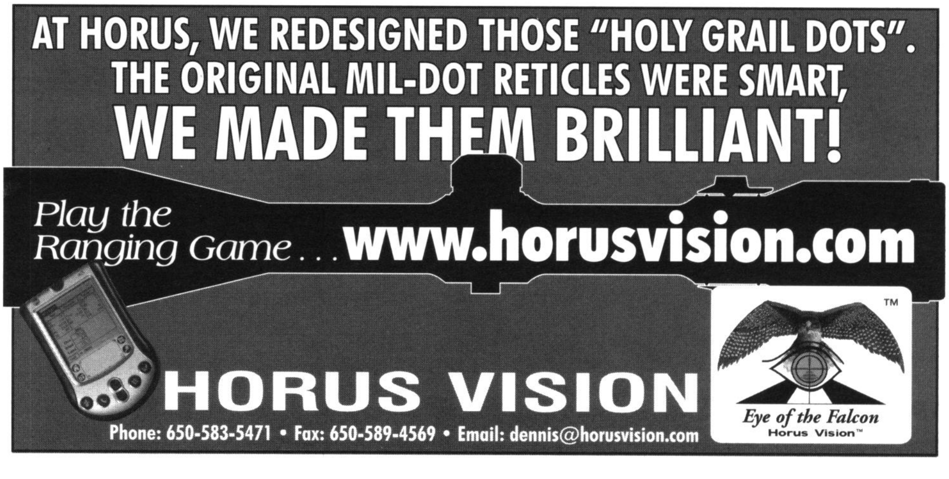

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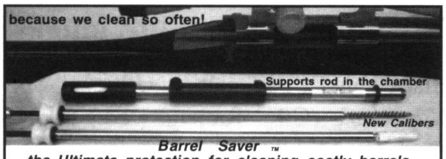

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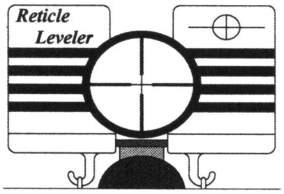

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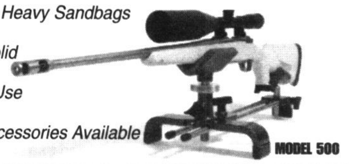

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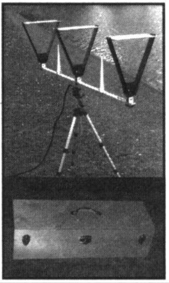

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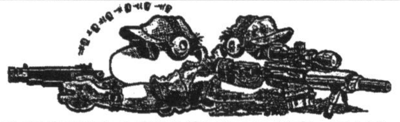

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WANTED: Scope, Leupold 36D. Call Roger 360-295-0026.

FOR SALE: 1000 Yd. Bench & F Class Competition Rifle. Stolle Kodiak RB, RP, "Polished" action. Jewell trigger with safety, Shilen S.S. 28" 6.5x284 1-8 twist 290 neck, Shehane chamber. Shehane Rosewood and black laminated Tracker stock with Anschütz rail, aluminum long range tapered scope base, Webley rings, rear sight base, Redding dies, Shehane chamber. Wilson Seater, 50 Rds. Lot #4 new Norma brass. Gun weighs 13-1/4 lbs. Everything new. Built by: John Pierce, Lansing MI, $3,500.00. Call 419-454-2522.

FOR SALE: Elmer Keith – Original firearms related letters written while with NRA: 1954 (four), 1956 (one). All signed "Keith." $125.00 each. Herb 626-359-5579.

MISSING: 6PPC Borden built Nesika #0006, Krieger Fluted barrel light blue metallic Borden stock. Brown 517-546-5829. (5/03-6/03)

FOR SALE: Remington 788 bolt action custom .243 Ackley, 26" Krieger LV stainless barrel, .270 neck 1-9 twist, action trued & E nickeled, 700 recoil lug, Canjar trigger, McMillan hunter class stock, pillar bedded, Burris signature rings & bases, 250 rounds fired, Redding comp dies & Lapua brass, smithed by SG&Y, Exc.condition, $975.00 + UPS. Leupold premier scope 18.5X35 target knobs 30mm tube side focus, .0017 target dot, black matte, L.N. in box with papers $675.00 + UPS. Competition Electronics chronograph LN $80.00. Bruno McMillan LV stock for Panda RB, Exc. condition, $100.00. Phone 336-788-7228.

FOR SALE: DGA action 308 bolt, repeater. $800.00 + shipping. Call Jim 308-785-2608 after 6:00 PM. (5/03-6/03)

WANTED: 32-40 based on Highwall or Ruger No. 1 action for cast bullet shooting from a rest. Also looking for *American Rifleman* magazines from #1 through the 1930's to complete my set. Tom 231-829-3438 evenings.

FOR SALE: Magazines – *Precision Shooting* November '95 to present, in mailing envelopes. *Varmint Hunter* January '93 to present, in envelopes. *Rifle* March '96 to present, in envelopes. *Handloader* May '89 to present, in envelopes. *American Rifleman* January '75 to present, plus numerous issues from 1960s. Paul Shaffer 570-322-5295.

ESTATE SALE: LV 6PPC, Panda action, Jewell trigger, Shilen barrel, $1,300.00. Oehler chronograph, $275.00. Forester CO-AX press, $250.00. *Precision Shooting*, 118 issues, 1992-1995 & 1997-2002, $125.00. Will consider any reasonable offer. Ron Miller 303-428-8945.

FOR SALE: The very first issue of *Precision Shooting* magazine. , Vol-1, No-1, May 1956. John Zink is on the cover. Best reasonable offer. Judy Deming at 570-827-2888 or Bigjude@stny.rr.com.

SCOPES WANTED: USMC marked Unertl – Unertl's – Lyman's – Fecker's – Redfield 3200 or other target scopes. **BUY, SELL, OR TRADE.** Call Dewy at (320) 795-2930 or check my website at www.alexweb.net/unertl. (monthly)

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IBS News

President's Message

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As you read this our 2003 competitive season is already underway. Our schedule of events over the years has continued to grow in number of matches as well as number of places that matches are held. Score Shooting, Group Shooting and 1000 yard shooting schedules have grown for 2003.

Specific details of registering 600 Yard matches are still being developed by the committee. I have been assured at the time this is being written (Late March 2003) that the Executive Board will soon receive a firm proposal on the rules of competition for 600 Yard Benchrest Matches. Keep watch at www.international-benchrest.com for specific plans for this competition. There are currently four clubs that have indicated interest in holding registered 600 yard matches in 2003. The committee has been struggling with the input they have received on classes of competition. One set of input advocates an open system where anyone can shoot what they have and everything would be shot as one class. Another set of input suggests that it would make a lot of sense to adopt the Light and Heavy Gun rules that are currently used for 1000 yard competition. Some club concerns have been expressed over the second option. There seems to be overwhelming input that individuals interested in the 600 yard competition want to shoot aggregates of 3 to 4 targets. The club concern is having enough time to run two classes in a day. An option to alleviate this concern is to conduct the competition of both classes simultaneously like has been so successful for Score Shooting. We would appreciate hearing input from those that would actively participate in 600 yard benchrest competition. Please contact Rob Ritchie (RHR1036yd@aol.com or 540 439-3613), Bill Truitt (511 Gunby Road Salisbury MD 21804), or myself (jim@bordenrifles.com or 570-965-2505) with your input.

The IBS website continues to grow and improve. Schedules for all four disciplines have been posted and have been updated as changes are made by clubs. Please watch the schedules for additions and/or changes throughout the year. We anticipate using the "news" section to announce changes that clubs have had to make due to circumstances beyond their control. This should be a rare occurrence, but posting the information on the web page provides an efficient and effective way to communicate such changes with those planning on attending. IBS Records information has been updated by Michelle Sutton and is now complete and accurate. We are still working to get the 1000 yard Shooter of the Year information and the 1000 Yard Precision Rifleman points posted. Our plans are to have that information posted by the time you read this in PS. The "Affiliated Range List" continues to be updated and improved in format. Please bear with us as we further develop this section of the web site. Our plans for the range list are: 1) add physical address of club to list, 2) Add the GPS coordinates when available for the club and, 3) add e-mail addresses for the club contacts that have them. A mass mailing has been sent out to the clubs soliciting added information that we desire to assist members in planning attendance at shoots. We may also add a downloadable version of the "IBS Range Guide" to the Range page.

Anyone thinking of having rule changes or additions voted on at the 2004 Annual Meeting should be getting the necessary 25 signatures on a proposed change and to the appropriate committee before July 1, 2003.

Until Next Time
Jim Borden—President IBS

2003 IBS MATCH SCHEDULE

TENTATIVE

2003 IBS GROUP SCHEDULE

DATE	SHOOT NAME	LOCATION	YARD.	START TIME	CLASSES	ROTATION
May03		Boone Valley IKES	100/200	9:00	LV	YD
May04		Boone Valley IKES	100/200	9:00	HV	YD
May03	Keystone Challenge	Palmisano's	100	8:00	HV/LV	YD
May04	Keystone Challenge	Palmisano's	200	8:00	HV/LV	YD
May10	Memorial Shoot	Union County	100	8:00	LV,HV	YD
May11	Memorial Shoot	Union County	200	8:00	LV/HV	YD
Jun01		Fairfax	200	10:00	HV	
Jun07	Myles Hollister	Palmisano's	100	8:00	SP,HV	YD
Jun08	Myles Hollister	palmisano's	200	8:00	HV,SP	YD
Jun21	PA State Championship	SCNT	100	8:00	HV,LV	FR
Jun22	PA State Championship	SCNT	200	8:00	HV,LV	FR
Jun28	Iowa LV states	Boone Valley IKES	100/200	9:00	LV	YD
Jun29	Iowa HV states	Boone Valley IKES	100/200	9:00	HV	YD
Jul04	Seely Masker Challenge	Painted Post	100/200m	8:00	SP	FR
Jul05	Seely Masker Challenge	Painted Post	100M	8:00	HV/LV	FR
Jul06	Seely Masker Challenge	Painted Post	200M	8:00	LV/HV	FR
Jul18	100 yd	Canastota	100	9:00	HV,LV	FR
Jul19	200/300 Championships	Canastota	200	8:00	HV,LV	FR
Jul20	200/300 Championships	Canastota	300	8:00	HV,LV	FR
Jul27		Fairfax	200	10:00	HV	
Aug02	Nat. Warm Up	Union County	100	8:00	LV,HV	YD
Aug03	Nat. Warm Up	Union County	200	8:00	HV, LV	YD
Aug10		San Gabriel Valley BR	100		HB/SP	
Aug18	Nationals	Palmisano Memorial	200	9:00	HB	FR
Aug19	Nationals	Palmisano Memorial	100	9:00	HB	FR
Aug20	Nationals	Palmisano Memorial	100	8:00	LV/SP	FR
Aug21	Nationals	Palmisano Memorial	100	9:00	HV	FR
Aug22	Nationals	Palmisano Memorial	200	8:00	LV/SP	FR
Aug23	Nationals	Palmisano Memorial	200	9:00	HV	FR
Sep06	NY Championship	Camillus Sportsmen Club	100	8:00	HV,LV	AG
Sep07	NY Championship	Camillus Sportsmen Club	200	8:00	HV/LV	AG
Sep20		Canastota	100	8:00	HV,LV	FR
Sep21		Canastota	200	8:00	HV,LV	FR
Sep27	Night Shoot	Palmisano's	100	7:30pm	HV,LV,HB	NR
Oct26		Fairfax	200	10:00	HV	

TENTATIVE

2003 IBS SCORE SCHEDULE

DATE	SHOOT NAME	LOCATION	YARD.	START TIME	CLASSES	ROTATION
May03		Black Creek	100	10:00	VFS,H,VH	
May04		Orrington R&G	100	9:00	H,VH,VFS,F	
May04		Bridgeville	100	10:00	VFS, H, VH,FAC	
May11		Thurmont	100	11:00	VFS,H,VH,FAC	
May10		Western Wayne	100/200	9:00	VFS, H, VH,FAC	YR
May17		MGGOA	100/200	9:00	H,VH,VFS,F	
May18		Capitol City	100		VFS,H,VH,FAC	
May18		Roseburg R&G			VFS	
May18		York	100	10:00	VFS,H,VH	
May18		Braxton County	100/200	10:00	H,VH,VFS	
May18		Wyoming Antelope	100	9:00	VFS	NR
May24		Boone Valley IKES	100/200	9:00	H, VFS	YD
May25		Boone Valley IKES	100/200	9:00	VFS	YD
May25		Lincoln County	100	9:00	HTR,VH,VFS	
May31	2nd Ann. Fire Cracker	Orrington R&G	100	9:00	V,H,VH,FAC	YR
Jun01		Orrington R&C	200	9:00	H,VH,VFS,F	
Jun01		Mainville	100	10:00	HTR,VH,H,VFS,FAC	
Jun07		Mt. Airy	300	10:00	h,vh,vfs,fac	
Jun07		Pinetucky	100	9:00	VFS, VH, H	
Jun08		Bridgeville	200	10:00	VFS, H, VH,FAC	
Jun08	1st Leg Ironman	Sulphyr Springs	100	10:00	VFS,H,VH,FAC	
Jun14		Piedmont	200	9:00	VFS	NR
Jun14	9th Bud Pryor Memorial	Thurmont	100	8:00	VFS,H,VH,FAC	YR
Jun14	9th Bud Pryor Memorial	Thurmont	200	1:00	VFS,H,VH,FAC	YR
Jun15	9th Bud Pryor Memorial	Thurmont	300	9:00	VFS,H,VH,FAC	YR
Jun15		Wyoming Antelope	100	9:00	VFS	NR
Jun22		Lincoln County	100	9:00	HTR,VH,H,VFS,	
Jun22		Braxton County	100/200	10:00	H,VH,VFS	
Jun22	York Co. Championships	York	100	10:00	VFS,H,VH	
Jun28	PA States	Union County	100	10:00	VFS,H,VH,FAC	YD
Jun29	PA States/ 2nd leg Ironman	Union County	200	10:00	VFS,H,VH,FAC	YD
Jun29		Fairfax	200	10:00	h,vh,vfs	

TENTATIVE

2003 IBS SCORE SCHEDULE (continued)

DATE	SHOOT NAME	LOCATION	YARD.	START TIME	CLASSES	ROTATION
Jun29		orrington r&g	100	9:00	H,VH, VFS	
Jul05		Black Creek	100	10:00	VFS,H,VH	
Jul05		Pinetucky	100	9:00	H, VH, VFS	NR
Jul06		Lincoln County	200	9:00	HTR,VH,VFS	
Jul12	Me states championship	Capitol City	100	9:00	VFS,H,VH	
Jul13		Capitol City	200	9:00	VFS,H,VH	
Jul13		Sulphyr Springs	100	10:00	VFS,H,VH,FAC	
Jul20		Wyoming Antelope	100	9:00	VFS	
Jul20		York	100	10:00	VFS,H,VH	
Jul27		Lincoln County	300	9:00	HTR,VH,VFS	
Jul27		Braxton County	100/200	10:00	YH,VH,VFS	
Jul27	3rd Leg Ironman	Mainville	300	10:00	HTR,VH,H,VFS,FAC	
Aug01	Iowa hunter states	Boone Valley IKES	100/200	9:00	H	YD
Aug02		Boone Valley IKES	100/200	9:00	VFS	YD
Aug03	Iowa hunter states	Boone Valley IKES	100/200	9:00	VFS	YD
Aug02		Black Creek	100	10:00	VFS,H,VH	
Aug02		Bridgeville	100	10:00	VFS, H, VH,FAC	
Aug03		Bridgeville	200	10:00	VFS,H, VH, FAC	
Aug03		Sulphyr Springs	100	10:00	VFS,H,VH,FAC	
Aug03		orringtin r&g	100	9:00	all	
Aug09	200/300 Score Nationals	Thurmont	200	10:00	VFS,H,VH,FAC	FR
Aug10	MD States	Thurmont	300	9:00	VFS, H, VH,FAC	FR
Aug16		Western Wayne	100/200	9:00	VFS, H, VH,FAC	YR
Aug16	WV State Championships	Braxton County	100	10:00	H,VH,VFS	FR
Aug17	WV State Championships	Braxton County	200	10:00	H,VH,VFS	FR
Aug17		Orrington R&C	100	9:00	H,VH,VFS,F	
Aug17		Wyoming Antelope	100	9:00	VFS	
Aug17		York	200	10:00	VFS,H,VH	
Aug24		Mainville	100	10:00	HTR,VH,H,VFS,FAC	
Aug30	100 meter record	Painted Post	100m	11:00	VFS,H,VH	FR
Aug31	NY Score Championship	Painted Post	200M	11:00	VFS,H,VH	FR
Aug30		Pinetucky	100	10:00	H, VH, VFS	NR
Aug31		Fairfax	200	10:00	H,VH,VFS	
Aug31		Orrington R&C	100	9:00	H,VH,VFS,F	
Sep07		Sulphyr Springs	100	10:00	VFS,H,VH,FAC	
Sep07		Thurmont	200	11:00	VFS,H,VH,FAC	
Sep13		Piedmont	100	9:00	VFS	YR
Sep14		Piedmont	200	9:00	VFS	YR
Sep13	SCORE NATIONALS	Mainville	100	10:00	VFS,H,VH	FR
Sep14	SCORE NATIONALS	Mainville	200	9:00	VFS,H,VH	FR
Sep20		Boone Valley IKES	100/200	9:00	H,VFS	YD
Sep21		Boone Valley IKES	100/200	9:00	VFS	YD
Sep21		Capitol City	100	9:00	VFS,H,VH	
Sep21		Wyoming Antelope	100	9:00	VFS	NR
Sep21		York	100	10:00	VFS,H,VH	
Sep27	MI states	Western Wayne	100/200	9:00	VFS, H, VH,FAC	
Sep28		Fairfax	200	10:00	H, VH, VFS	
Sep28		Union County	100	10:00	VFS,H,VH,FAC	
Sep28		Orrington R&C	100	9:00	H,VH,VFS,F	
Oct04		MGGOA	100/200	9:00	VFS,H,VH	
Oct04	MD States	Thurmont	100	10:00	H,VH,VFS,F	YR
Oct05	MD States	Thurmont	200	9:00	H,VH,VFS,F	YR
Oct05		Sulphyr Springs	100	10:00	VFS,H,VH,FAC	
Oct11	ME 200/300Championships	Lincoln County	200	9:00	H,VH,VFS	
Oct12	ME 200/300 Championships	Lincoln County	300	9:00	H,VH,VFS	
Oct19		York	100	10:00	VFS,H,VH	
Nov01		Western Wayne	100	9:00	VFS, H, VH,FAC	
Nov09		Thurmont	100	10:00	VFS,H,VH,FAC	
Nov23		Fairfax	200	10:00	all	
Dec21		Fairfax	200	10:00	all	
Dec14		Western Wayne	100	10:00	VFS, H, VH,FAC	

2003 IBS 1000 YARD MATCH SCHEDULE

DATE	SHOOT NAME	LOCATION	YARD.	START TIME	CLASSES	ROTATION
May 10,11	Match 3,4	Ohio 1000 YD Club	1000	9:30	LG/HG:HG/LG,F	
May17	Match 4	NC 1000 yd BR Assoc	1000	9:30	Light/Heavy	
May 24,25	Match 3,4	VA 1000yd BR Club	1000	9:00	LG/HG:HG/LG,F	
May31	Match 3,4	Iowa 1000 YD BR Assoc	1000	9:00	Light/Heavy/Fac	
May31	Match 5	NC 1000 yd BR Assoc	1000	9:30	Light/Heavy	
Jun 7,8	Match 5,6	VA 1000yd BR Club	1000	9:00	LG/HG:HG/LG,F	
Jun 14,15	Match 5,6	Ohio 1000 YD Club	1000	9:30	LG/HG:HG/LG,F	
Jun 21,22	N.C. States Match 6,7	NC 1000 yd BR Assoc	1000	9:30	Light/Heavy	

2003 IBS 1000 YARD MATCH SCHEDULE (continued)

DATE	SHOOT NAME	LOCATION	YARD.	START TIME	CLASSES	ROTATION
Jun28	Match 5,6	Iowa 1000 YD BR Assoc	1000	9:00	Light/Heavy/Fac	
Jul 19,20	Ohio States Match 7,8	Ohio 1000 YD Club	1000	9:30	LG/HG:HG/LG,F	
Aug 2,3	Match 7,8	VA 1000yd BR Club	1000	9:00	LG/HG:HG/LG,F	
Aug 9,10	Practice*	VA 1000yd BR Club	1000	9:30	LG/HG:HG/LG,F	
Aug 9,10	Match 9,10	Ohio 1000 YD Club	1000	9:30	LG/HG:HG/LG,F	
Aug16	Match 8	NC 1000 yd BR Assoc	1000	9:30	Light/Heavy	
Aug29	practice	VA 1000yd BR Club	1000	9:00		
Aug30	Nationals	VA 1000yd BR Club	1000	9:00	Light/Heavy	
Aug31	Nationals	VA 1000yd BR Club	1000	9:00	Light/Heavy	
Sep01	rain date	VA 1000yd BR Club	1000	9:00	Light/Heavy	
Sep06	Match 7,8	Iowa 1000 YD BR Assoc	1000	9:00	Light/Heavy/Fac	
Sep 13,14	extra matches	Ohio 1000 YD Club	1000	9:30	LG/HG:HG/LG,F	
Sep20	Match 9	NC 1000 yd BR Assoc	1000	9:30	Light/Heavy	
Oct04	Match 9,10	Iowa 1000 YD BR Assoc	1000	9:00	Light/Heavy/Fac	
Oct 4,5	Make Up Match (if needed)	Ohio 1000 YD Club	1000			
Oct 4,5	Match 9,10	VA 1000yd BR Club	1000	9:00	LG/HG:HG/LG,F	
Oct18	Match 10	NC 1000 yd BR Assoc	1000	9:30	Light/Heavy	
Nov01	Make Up Match (if needed)	NC 1000 yd BR Assoc	1000	9:30	Light/Heavy	
Nov08	Make Up Match (if needed)	NC 1000 yd BR Assoc	1000	9:30	Light/Heavy	
Nov 8,9	open dates	VA 1000yd BR Club	1000			

2003 IBS RIMFIRE SCHEDULE

DATE	SHOOT NAME	LOCATION	YARD.	START TIME	CLASSES	ROTATION
May17	NC State Championship	Piedmont	50	9:00	10.5,13.5	FR
Sep21	WV State Championship	Braxton County	50	10:00	S, 10.5, 13.5	FR

DUNHAM'S BAY

Some 17 shooters showed up at The Bay to contest the opening match of the 2003 Winter League on January 5th. When the smoke finally cleared, Dr. Richard Maretzo narrowly beat out Jim Griffin for the day's honors. Top three: 1) Richard Maretzo .2016, 2) Jim Griffin .2076, 3) Lance Hicks .2124.

NAME	CALIBER	ACTION	BARREL	GUNSMITH	STOCKER	SCOPE/POWER	POWDER/WEIGHT	CASE	BULLET/WEIGHT	PRIMER
RICHARD MARETZO	6PPC	HALL-B	HART	HART RB	BORDEN	B&L-36	8208	SAKO	EUBER	205M
JIM GRIFFIN	6PPC	HART	HART	LACHAPELLE	MONELL	LEU-36	N133	SAKO	EUBER 66	205M
LANCE HICKS	6PPC	HALL	SHILEN	MEYER	HICKS	B&L-36	201 29.3	SAKO	GENTNER 65	205M
PHIL VANASSE	6PPC	STOLLE	HART	ALVEY	NA	TASCO-36	N133 29.4	NA	FOWLER 66	205M
JIM MEYER	6PPC	STOLLE	SHILEN	MEYER	MEYER	LEU/TUCK-36	8208	LAPUA	WATSON	205M
SCOTT MILLER	6PPC	STOLLE	HART	SPEEDY	ADAMOWITZ	WEA-36	N133	LAPUA	SPEEDY 68	205M
JOHN DEL SAVIO	6PPC	40X	HART	S. MASKER	S. MASKER	LEU-36	N133	LAPUA	EUBER	205M
ALLIE EUBER	6PPC	VIPER	HART	GOODLING	GOODLING	LEU -45	N133 29	LAPUA	EUBER 67	205M
LEE EUBER	6PPC	FARLEY	HART	M. HOLLISTER	BORDEN	LEU-45	8208	LAPUA	EUBER 68	205M
ROBERT PECK	6PPC	STOLLE	HART	MEYER	MEYER	LEU-36	N133 29	LAPUA	D. SHORT 66	205M

DUNHAM'S BAY

This is the February 23rd date Winter League match at The Bay. There were 16 shooters contesting the issue. Top three shooters for the day: 1) Jim Griffin .2346, 2) Ed Mrozik .2452, 3) Phil Vanasse .2576.

Heavy Varmint Equipment List - Top 10 Date: 2/23/03

Name	Cal.	Action	Barrel	Gunsmith	Stocker	Scope	Case	Powder	Load	Bullet	Primer
JIM GRIFFIN	6PPC	HART	HART	LACHAPELLE	MONELL	LEU-36	LAPUA	N133		EUBER-66	205M
ED MROZIK	6PPC	PANDA	HART	BORDEN	BORDEN	LEU-36	LAPUA	N133	28	HOLL-65	205M
PHIL VANASSE	6PPC	STOLLE	HART	ALVEY	ALVEY	LEU-36	LAPUA	N133	29.2	FOWLER	205M
JOHN DEL SAVIO	6PPC	REM 40X	HART	S. MASKER	S. MASKER	LEU-36	LAPUA	N133		EUBER	205M
ROLAND MILLER	6PPC	NESIKA	HART	SPEEDY	SPEEDY	LEU-45	LAPUA	8208		WATSON	205M
ROBERT MABEUS	6PPC	TEDDY	HART	ZACK	BORDEN	LEU-36	LAPUA	N133	28.5	EUBER-68	205M
ROBERT GRIFFIN	6PPC	VIPER DP	SHILEN	LACHAPELLE	LACHAPELLE	LEU-40	LAPUA	N133		EUBER-66	205M
NANCY VAN WIE	6PPC	REM 40X	HART	HASECUSTER	HASECUSTER	LEU-36	LAPUA	N133	28	HOLL-65	205M
RICHARD JOHNSON	6PPC	HART 1A	HART	B. WHITE		LEU-36	LAPUA	N133	28.3	HOLL-65	205M
ALLIE EUBER	6PPC	VIPER DP	HART	GOODLING	GOODLING	LEU-45	LAPUA	N133	29.7	EUBER-68	205M

Official I.B.S. Group Metric Records (MOA)
As of January 1, 2003

	Heavy Bench	Light Varmint	Sporter	Heavy Varmint
GROUPS				
10-100	**.183 M. Bennett 8/26/02**			
10-200	**.291 B. Wahl 8/27/02**			
10-300	**.918 Rhinehart 8-30-57**			
5-100		**.085 B. Wieder 9-3-84**	**.090 J. Oliver 8-31-85**	**.061 A. Euber 9-6-81**
5-200		**.197 D. Pessall 8/29/02**	**.245 M. Gamble 8/29/02**	**.113 G. Manfredini 4-27-86**
5-300	**.605 P. Gottschall 5-9-65**	**.887 D. Hall 5-30-69**	**.817 D. Kiel 5-30-69**	**.787 Bassett 10-6-68**
AGGREGATES (Bracketed numbers in MOA-Others simple aggs)				
5-10-100	**.2692 (.2462) A. Euber 9-6-81**			
5-10-200	**.3242 (.2963) B. Sauter 8/27/02**			
5-10-300	**.5105 (.4668) A. Angerman 6-1-69**			
5-5-100		**.1898 (.1735) J. Brown 8/28/02**	**.2100 (.1919) W. Campbell 8/28/02**	**.1812 (.1657) R. Maretzo 2-13-83**
5-5-200		**.2053 (.1876) J. Neary 8/29/02**	**.2198 (.2009) M. Gamble 8/29/02**	**.2183 (.1996) F. Obrachta 6-27-82**
5-5-300	**.3547 (.3243) Demoise 5-14-66**	**.5527 (.5054) T. Seitz 6-22-68**	**.4989 (.4562) W. Dunn 5-30-69**	**.4640 (.4243) Mick 5-7-67**

GRAND AGGREGATES: Bracketed numbers in MOA-Others Simple Aggs.

5-10-(100/200)	**.2973 (.2719) A. Euber 9-7-81**			
5-5-(100/200)		**.2047 (.1871) J. Neary 8/29/02**	**.2308 (.2170) C. Spencer 8/29/02**	**.2391 (.2186) N. Boop 9-4-83**

TWO GUN RECORDS: Bracketed numbers in MOA- Others Simple Aggs.

LV/HV 100/200 Meters	**.2540 (.2321) Pat Byrne 8/31/02**

RIMFIRE RECORDS AS OF JANUARY 1, 2003

Sporter Class	**Kay C. Young**	**250-17X**	**7/19/98**
10.5 # Class	**K. C. Young**	**250-23X**	**06/01/00**
13.5# Class	**Mike Ryan**	**250-23X**	**7/19/98**
Three Gun Agg.	**Mike Ryan**	**750-54X**	**7/19/98**

DUBLIN

(It's always startling for an Editor of-obviously-Irish descent to see a report of a benchrest match in Dublin come across my desk. But I digress…)

"Maybe we should call this one (March 15th, a 100/200 yard Score Match at the Dublin, GA club) 'The Soggy Bottom 100/200.' It rained about an inch and a half on Saturday morning, finally stopping at about 11:00AM. The winds were typical of Dublin, running from 10 o'clock to 3 o'clock, with guests in the high teens. All the folks coming to the Shamrock Festival this weekend will get a good dose of the tricky winds. At 100 yards it was Joe Entrekin in first place with a 250-21x, Robert Gregory second with 250-15x, and Mike Rippey third with 250-15x. In the PM at 200 yards, Jason Barnette shot steadily through all the matches to win the yardage agg with 250-9x, Joe Entrekin closed fast to finish second also with a 250-9x and in the third spot was Greg Ellis with his 250-3x. The Grand Agg was won by Joe Entrekin with a 500-30x, second was Greg Ellis with a 499-19x and third was Jason Barnette with 499-19x total."

MGGOA, DUBLIN, GA 3-15-03
IBS REGISTERED 100/200 SCORE MATCH
EQUIPMENT LIST

NAME	CALIBER	ACTION	BARREL	GUNSMITH	STOCKER	SCOPE	CASE	LOAD	BULLET	PRIMER
JOE ENTREKIN	30BR	FARLEY	KRIEGER	G LONG	R LONG	LEU 45X	LAPUA	34 H4198	BIB 118/10	205M
GREG ELLIS	6PPC	STOLLE	SHILEN	GREEN	GREEN	WEA 36X	LAPUA	27 H322	GREEN	205
JASON BARNETTE	6PPC	PANDA	SHILEN	B GREEN	B GREEN	WEA 36X	LAPUA	28.5 N133	BARTS	205

THE INTERNATIONAL SHOOTING RANGE ENHANCEMENT FOUNDATION

More than half a century ago a great event having to do with precision accuracy was staged. Formal benchrest shooting competition as we have known it was born. It is safe to say that no one at that very first match would have ever believed what would evolve from then until the present day. This is history and we all know that what resulted has been far reaching in the many areas of our custom built rifles as well as those produced by the major firearm manufacturers.

Throughout this time frame shooting ranges for benchrest shooting competition have been established. Some of these ranges have stood the test of time, some have not, and some need help. It is at this juncture that the official introduction of the International Shooting Range Enhancement Foundation (ISREF) is presented to benefit the benchrest shooting community. The purpose and mission of ISREF can best be described in one word: "HELP". With your support, ISREF can help, not only preserve, but improve benchrest shooting for the benefit of all those involved in this great sport.

ISREF has been approved under section 501(c)(3) of the U.S. Treasury and has been granted a tax exempt status. This means that contributions made to ISREF by individuals, Proprietorships, Corporations and other qualified entities will have a legal tax deduction based on the value of the gift. Many kinds of contributions can be accepted, of course, cash is one; other examples include stocks, investment instruments, property, supplies and equipment. They all qualify as tax deductible gifts. Also, there will be an Endowment Program established that will play an important role by hopefully amassing a base amount of funds which can be used to develop a grant program. More details regarding this program will be developed in the near future.

We are all aware of the importance shooting ranges have for our sport to survive. Therefore, a priority must be placed on such things as expanding and updating ranges that currently exist, helping smaller ranges grow to a size that will accommodate competition events and the revitalization of ranges that have great potential and history, but are no longer active. With your support, ISREF hopes to make grants & low interest loans, as well as provide other vital help that will not only preserve, but enhance the future of our great sport of benchrest shooting.

Even though ISREF is separate and solely independent from any other organization, it is important to state that its existence is due to the efforts of the IBS Executive Board and their appointed committees. Also, of equal importance is the fact that we wish to dedicate the success of this endeavor to the many of those that have contributed to the ongoing success of benchrest shooting worldwide. So, it is in their honor we go forward.

ISREF Trustees are: Butch Wahl, Bill Rowley and Bill Krasinski

Contributions can be mailed to: ISREF
c/o Butch Wahl
779 Ling Road
Somerset, PA 15501

Thank you and remember: "**Without Shooting Ranges, We are Nothing**"

Pinellas Shooting Range
3700 126th Avenue

Wyoming Antelope Club

Florida Chapter, Inc.
Pinellas Park, Florida

December 1, 2002

IBS 22 RIMFIRE BENCHREST

Competitor	Action	Barrel	Gunsmith	Ammo	Score
Sporter					
1. Richard Johnson	Rem 541	Walter	Bob Ji	Fed 900	248-06x
2. Gene Picard	Rem 541S	Factory	Factory	Fed 900	245-05x
3. John Palso	Sako	L:ilja	Self	Fed 900	242-08x
4. Neil Ewing	Sako	Factory	Self	Lapua	242-05x
5. James Scales	Rem 541	Lilja	C Slifer	Lapua Multi	240-04x
6. Cliff Smith	Savage LV	Factory	Factory	Fed 900	232-04x
10.5 Class					
1. John Palso	Ans 64	Factory	Self	Fed 900	249-15x
2. Neil Ewing	Win 52D	Factory	R Johnson	Lapua	249-14x
3. Cecil Kelly	Suhl	Factory	Williams	Lapua L	246-10x
4. Richard Johnson	Win 52C	Factory	Self	Fed 900	246-08x
5. James Scales	Walther	Factory	C Houston	Lapua Multi	245-11x
6. Cliff Smith	Ans 54	Factory	Factory	Fed 900	243-04x
7. Ray Baker	Ans 54	Factory	Factory	Fed 900	227-06x
13.5 CLASS					
1. Neil Ewing	Rem 40X	Douglas	Self	Lapua	250-17x
2. Richard Johnson	Win 52C	Factory	Self	Fed 900	250-16x
3. John Palso	Ans 64	Factory	Self	Fed 900	250-09x
4. James Scales	Walther	Factory	C Houston	Lapua Mul-M	248-10x
5. Gene Picard	Win 52B	Bohmill	C Slifer	Fed 900	247-12x
6. Ray Baker	Ans 54	Factory	Factory	Fed 900	246-06x
7. Cecil Kelly	Suhl	Factory	Williams	Lapua	246-05x
8. Cliff Smith	Ans 54	Factory	Factory	Fed 900	241-06x

Three Gun Agg.

1. R Johnson	744-30x
2. N Ewing	741-36x
3. J Palso	741-32x
4. J Scales	733-25x
5. C Smith	716-14x

Two Gun Agg.

1. N Ewing	499-31x
2. J Palso	499-24x
3. R Johnson	496-24x
4. J Scales	493-21x
5. C Kelly	492-15x
6. C Smith	484-15x
7. R Baker	473-12x

Match Director: James Scales
(407) 290-2533

FAIRFAX

Fairfax, VA held its final Winter League match of the year on March 15th. This 200 yard Score match was attended by 16 shooters, all of whom competed in the Varmint For Score class. The weather was quite pleasant but many shooters found conditions difficult. Curtis Nelson finished first with a 248-2x, Mark Lester second with a 247-4x, Wayne Shaw third with a 247-3x and Steve Stanley fourth with a 246-7x.

RIDGEVILLE

The Palmetto Gun Club, in Ridgeville, SC checks in with two match results for us.

A 100-200 yard Score match was held at the club on November 23rd.

H, VH and VFS classes were offered and 13 shooters shot the match. The weather started out quite cool in the morning with the winds nearly calm. As the morning progressed the wind and mirage started playing with the competitors. By the 200 yard stage the mirage was difficult for some of the competitors to overcome. Top three, grand agg: 1) Henry Rivers 497-26x, 2) Dave Burton 495-10x, 3) Johnnie Lorick 493-20x.

A 100-200 yard Score match was held at the club on December 28th.

H, VH and VFS classes were offered and 14 shooters shot the match. The weather was cool at the start of the match but was very nice by mid-day. Top three shooters: 1) Joe Entrecin 495-25x, 2) Roger Avery 495-19x, 3) Dave Burton 494-14x.

DUBLIN

"Well, it was supposed to rain, but instead we had a gorgeous day for February, with temps in the mid-70s and lots of sunshine. The wind was devilish though, gusting into the 20s and constantly switching. Winner of the 100 yard stage was Joe Entrekin with 250-17x, second was Charlie Hood with 250-15x and third was Henry Rivers with 249-14x. Winner of the 200 was Henry Rivers with 248-7x, second was Joe Entrekin with 247-8x and third was Charlie Hood with 246-7x. Grand agg winners: 1) Joe Entrekin 497-25x, 2) Henry Rivers 497-21x and 3) Charlie Hood with 496-22x. We had 13 shooters with several staying away because of the rain forecast."

INTERNATIONAL BENCHREST SHOOTERS APPLICATION

NAME ____

ADDRESS ____

CITY ____________________________ STATE __________ ZIP __________

COUNTRY ____

****

( ) IBS Membership and PS 1 Year – $40/yr.
( ) Associate Membership – Must live in same household as regular member – no PS – $10/yr.
( ) Junior Membership – 17 and under – no PS – $5/yr.
( ) USA Club Affiliation with 1 Year PS $40/yr.
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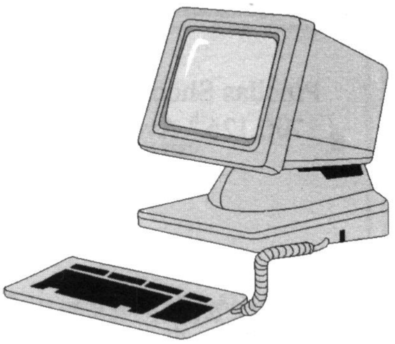
MAIL MEMBERSHIPS TO: JOAN BORDEN, RR 1 BOX 250 BB, SPRINGVILLE, PA 18844

Make Checks payable to: **IBS**

CHECKS MUST BE IN U.S. FUNDS OR THE CHECK WILL BE RETURNED



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NORTH CAROLINA 1,000YD BENCHREST ASSOCIATION
MATCH #1 REPORT - *MARCH 15TH*

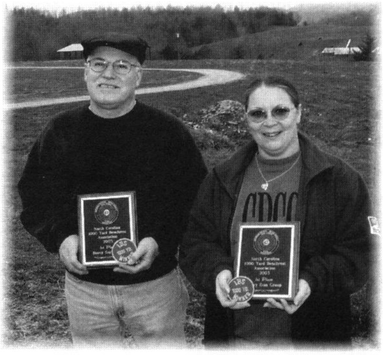
The Hawks Ridge Gun Club started off the 2003 IBS 1,000yd season on March 15th. The club hosted 83 Light Gun(LG), 51 Heavy Gun(HG), and 19 Factory Class(FC) shooters for this match. The weatherman didn't have a very good forecast for the weekend, but we never had a single drop of rain. For March it was very decent weather and some good groups and scores were recorded. The individual relay winners were: (*LG Group*) - Tony Rogers, Boyd Parlier, Michael Davis, Thomas Ellington, Bill Shehane, James Hardy II, and Ray Lowman. (*LG Score*) - Mathew Stanger, Marshall Eddy, Blake Daniels, Susie Cain, Wayne Lineberry, Craig Willis, and Greg Culpepper. (*HG Group*) - Thomas Ellington, Charles Sherin, Dennis Johnson, Charles Wooten, and Susie Cain. (*HG Score*) - Mathew Stanger, Blake Daniels, Bobby Elder, Bobby Greenway, and Richard DeSimone. *Small Group(s)* of the match goes to Bill Shehane with a 4.019" for LG class and Charles Sherin with a 5.819" for HG class. *High Score(s)* of the match goes to Blake Daniels with a 49 in LG class and to Susie Cain with a 99 in HG class. See you at the next IBS 1,000yd match which is back at Hawks Ridge on March 29th. Then it's off to the VA, Ohio, and Iowa clubs to get the 2003 season in full gear for the IBS.

See the complete results @ www.nc1000ydshooters.com

LG Shoot-off Winners

◄ (L) Bill Shehane - Group (4.670")
(R) Blake Daniels - Score (49)

HG Shoot-off Winners



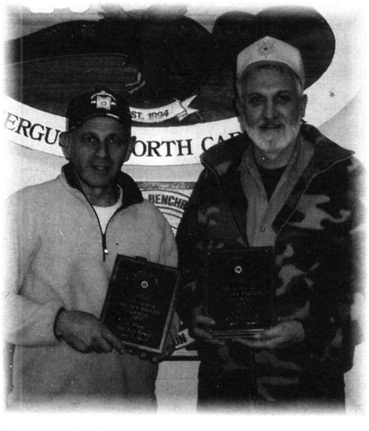
(L) Blake Daniels - Score (96)
(R) Susie Cain - Group (6.005") ►

NORTH CAROLINA 1,000YD BENCHREST ASSOCIATION
MATCH #2 REPORT - *MARCH 29TH*

Match #2 is in the history books thanks to some very good March Carolina weather. We had 89 Light Gun (LG) and 59 Heavy Gun (HG) shooters at this match. The individual relay winners were: (*LG Group*) - Debbie Yott, Jamie Cass, Joel Pendergraft, Danny Brooks, Larry Jones, Rich DeSimone, Blake Daniels, and Susie Cain. (*LG Score*) - Steve Shelp, Bobby Elder, Ray Lowman, Mark Simpson, Larry Bryant, Marvin Gragg, Phillip Yott, and R. Jeff Wyatt. (*HG Group*) - John Hildreth, Tony Rogers, Lewis Winkler, Johnny Byers, and Blake Daniels. (*HG Score*) - Shannon Lowman, Dennis Johnson, Kerry Vinson, Bobby Elder, and Tom Sarver. *Small Group* of the match goes to Blake Daniels with a 3.203" *official screamer* for LG class and Johnny Byers with a 6.616" for HG class. *High Score* of the match goes to R. Jeff Wyatt with a 49 in LG class and to Dennis Johnson with a 97 in HG class. Come visit any 1,000 yd range near you this summer.

See the complete results on our webpage: **www.nc1000ydshooters.com**

LG Shoot-off Winners



◄ (L) Rich DeSimone - Group (4.795")
(R) Larry Bryant - Score (42)

HG Shoot-off Winners

(L) Tom Sarver - Score (92)
(R) Blake Daniels - Group (9.908") ►

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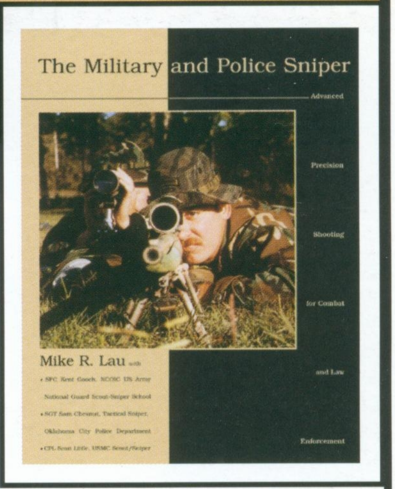
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BY MIKE R. LAU

with SFC Kent Gooch, NCOIC US Army National Guard Scout-Sniper School; SGT Sam Chesnut, Special Operations, Oklahoma City Police Department; and CPL Sean Little, USMC Scout/Sniper.

The principal of Texas Brigade-Armory, (and *Tactical Shooter* core staff member) Mike Lau, together with a well-credentialed member of the Army Scout-Snipers, the Marine Scout/Snipers, and a large city law enforcement tactical shooter... brings to publication a totally new work for the serious rifle accuracy enthusiast. The philosophy of *Tactical Shooter* magazine carries over here, as well... the rifle, its supporting accouterments, and the art and science of firing it accurately, from 50 to 1000 yards... is our topic. Tactics, philosophy, chain of command... you can, and will have to, acquire elsewhere... we're rifle accuracy people, period. We explained this foundation philosophy and direction to Mike Lau when he started to author this book for us... and lo and behold, he took to the idea like a duck to water.

Mike Lau's landmark 300-page book starts with two in-depth chapters on the evolution to date of the US Marine Corps Scout/Sniper rifle (the M40A1) and the US Army Scout-Sniper rifle (the M24). Immediately following is an authoritative chapter on "the long arm of the law"... the tactical rifle for today's police sniper. Then appears a series of successive chapters dealing with subjects of importance to today's professional tactical shooter... The custom sniper rifle and telescopes... terminal ballistics... internal ballistics... the development of the 7.62 X 51mm sniper cartridge... comparison of the .308 Winchester 5.56mm /.223, .338 Lapua, .50 BMG and others... external ballistics... range estimation and sight adjustment... uphill and downhill shooting... wind reading and sight adjustment... moving targets... managing the log/data book... tactical scenarios... (and) the sniper match.

ORDER NOW: **@ $35.00, plus shipping and handling. Shipping is $3.50 for the first book, $5.00 for multiple books - US. Foreign orders (including Canada) will be charged actual shipping costs, plus $1.00 handling. Order from: Precision Shooting, 222 McKee Street, Manchester, CT 06040. Phone (860) 645-8776, fax (860) 643-8215. Visa/Master Card orders accepted without surcharge. CT residents add 6% sales tax. NY residents add 4% sales tax.**

Joe Rychetnik Reflects On Guns, Hunting, and Days Gone By

Frankly we have no one quite like Joe Rychetnik on our staff...if for no better reason than there are not that many raconteurs of this caliber in existence at any given point in time. If adaptability is the true test of aristocracy...then Joe must be incognito royalty. His articles are enjoyed for their face value by the man in the street...and the better educated pick up on the drollery, subtleties, innuendoes, and whatever other literary machinations that Joe feels like employing today.

Joe has quite a colorful background, and has authored two previous books on specific eras of his life...*Bush Cop* told the story of the early days of the Alaskan State Police, created when the former territory became a full state in January of 1959. It was kind of wild back then, and Joe found himself "the" (only) policeman for a district that extended from Barrow on the Arctic Ocean to Hooper Bay, south of the mouth of the Yukon, including all the coastal villages and the islands on the Bering Sea...a beat equal to covering the West Coast of the South 48 from the Canadian line to Mexico.

Then his second book, *Alaska's Sky Follies*, covered the period after he left the Alaskan State Police (still in one piece, surprisingly) and became the reporter-photographer-correspondent for *Time-Life News Service* and *United Press International.* When these employers decided they wanted "the facts" on some particular goings-on, frequently there was no way to get there except to hire a bush-pilot, head in the appropriate general direction, and keep your fingers crossed. This was an earlier era of aviation when breaking the rules was the rule, and when legends-to-be such as Don Sheldon flew the skies across the huge new state of Alaska. There are a number of photos of Joe with the bush pilots and their planes...mostly the planes are upside down on ice floes, lakesides, and heaven only knows what else. And Joe is a former Marine as well...to the extent that any Marine can become a "former Marine"...he survived the World War II battle of Okinawa, and was a Marine Combat Photographer during the Korean War. Somehow or other Joe missed the French Foreign Legion...but he was seemingly mixed up in just about everything else of excitement in the second half of the 20th Century. What a wealth of storytelling possibilities such a background would give to even an ordinary soul...but give that background to a gifted storyteller/yarn spinner such as Joe Rychetnik...and you can rest assured that the tales will flow...and flow...and hundreds of people will forget their problems of the day, and settle down to enjoy the latest yarn.

There are some 275+ pages in our assembly of Joe Rychetnik yarns...and the yarn count stands at thirty... twenty-five of which were previously published in *Precision Shooting* and *Tactical Shooter* magazines...and five of which appear here for the first time in print. The titles of a half dozen or so of his articles give clues as to the book's subject matters..."The Smell of Good Times Past"... "Walking With Old Friends"... "Good-Bye Roberts"... "Requiem for a Great Lightweight"... "Where The Old Shooters Meet"... "Bear With Me"... "Rawhide, Gun Leather and The Space Age"... "The Bush Cops".

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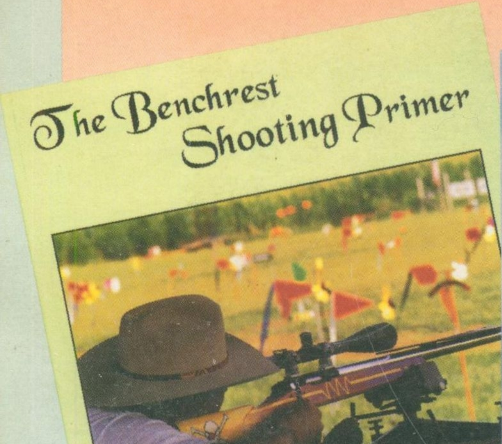
Competitive Shooting - Insider Info...

The Benchrest Shooting Primer, edited by Dave Brennan. It's 420 full size (8 1/2 x 11) pages, and 182 separate articles, all on the sole topic of "how to" benchrest shooting and reloading for benchrest shooting. The very best articles from the pages of *Precision Shooting* magazine from 1982-1996, with substantial input from a number of Benchrest Hall of Fame shooters, as well as leading accuracy gunsmiths, barrel makers and bullet makers. The one "must have" book on the most challenging of all the rifle accuracy disciplines. Softcover. **$24.95** ■

The Highpower Shooting Primer, edited by Dave Brennan. The very best articles on shooting and reloading for the most popular of all the rifle accuracy disciplines - highpower shooting - from the pages of *Precision Shooting* magazine 1990-1999. There's 173 articles spread over 520 full size (8 1/2 x 11) pages written by national and international champion shooters, and thoroughly covering highpower shooting from 300 to 1000 yards. There is extensive coverage of equipment selection, reloading, shooting in "conditions" and the advent of the AR-15 movement. Softcover. Oversize book, additional shipping charge. **$34.95** ■

Modern Highpower Competition - From Beginner To Master, by Randolph Constantine. Popular *Precision Shooting* columnist Randolph Constantine spent two years in the preparation of his major work on highpower rifle competition. It has over 600 full size (8 1/2 x 11) pages and over 100 illustrating photos and is remarkably reader-friendly in its approach to an occasionally daunting subject. Throughout the book the erudite Mr. Constantine sets out to explain the hows and whys of the most popular of the shooting sports over 25 informative and logically progressing chapters. A number of today's authorities consider this to be classic work on the subject. Softcover. Oversize book, additional shipping charge. **$39.95** ■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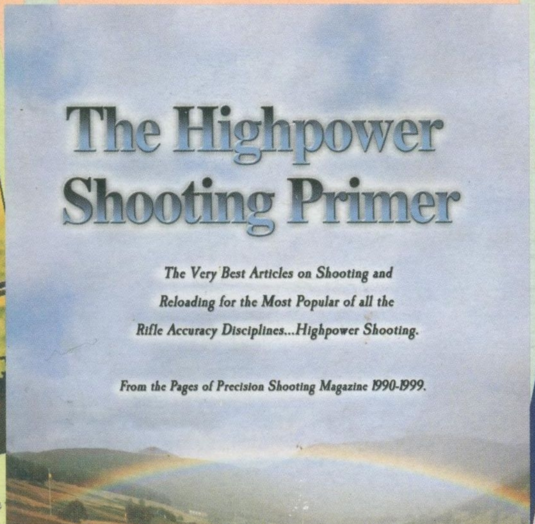
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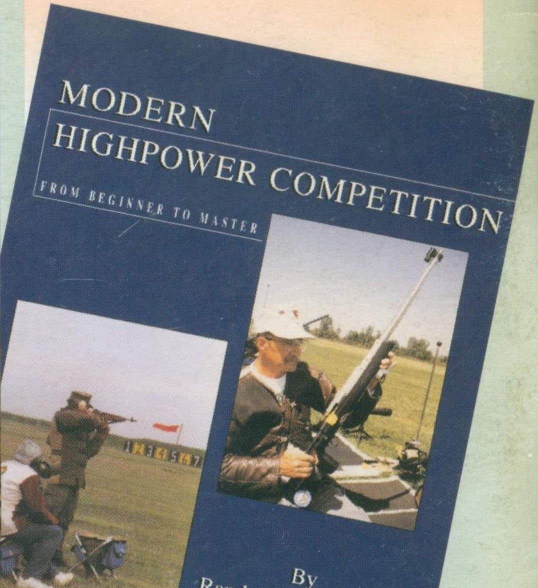
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